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OCTOBER 1935

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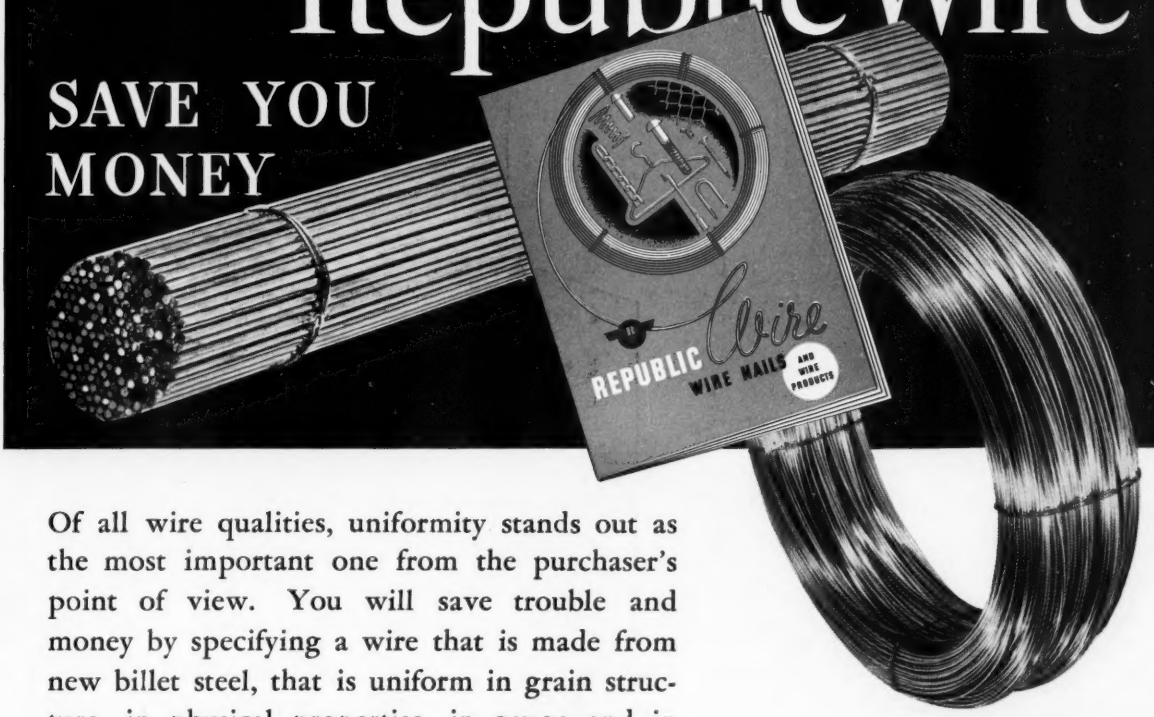

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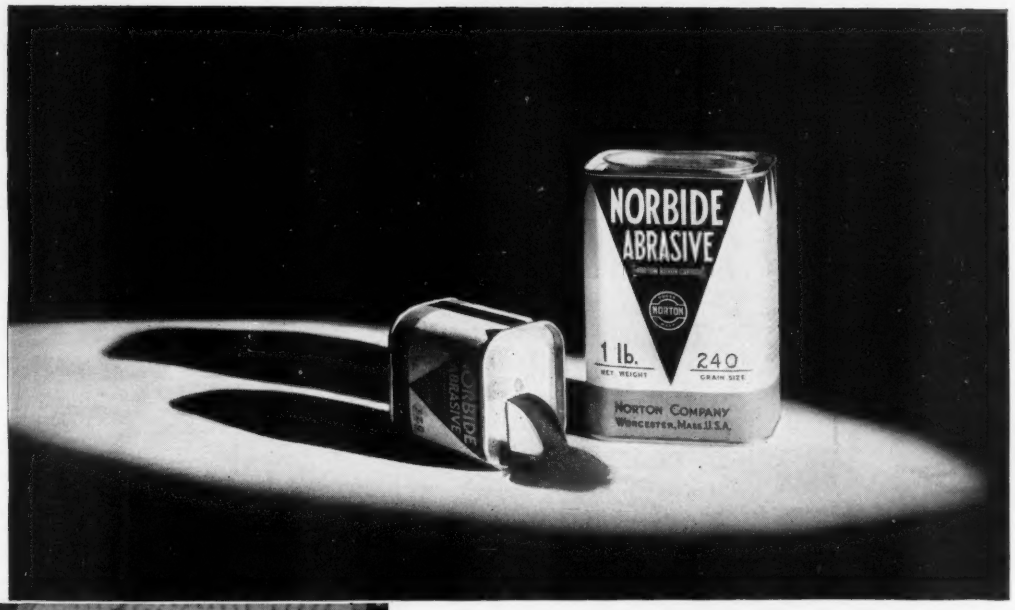

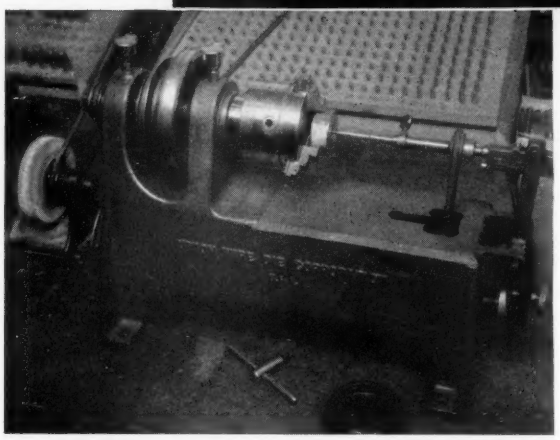

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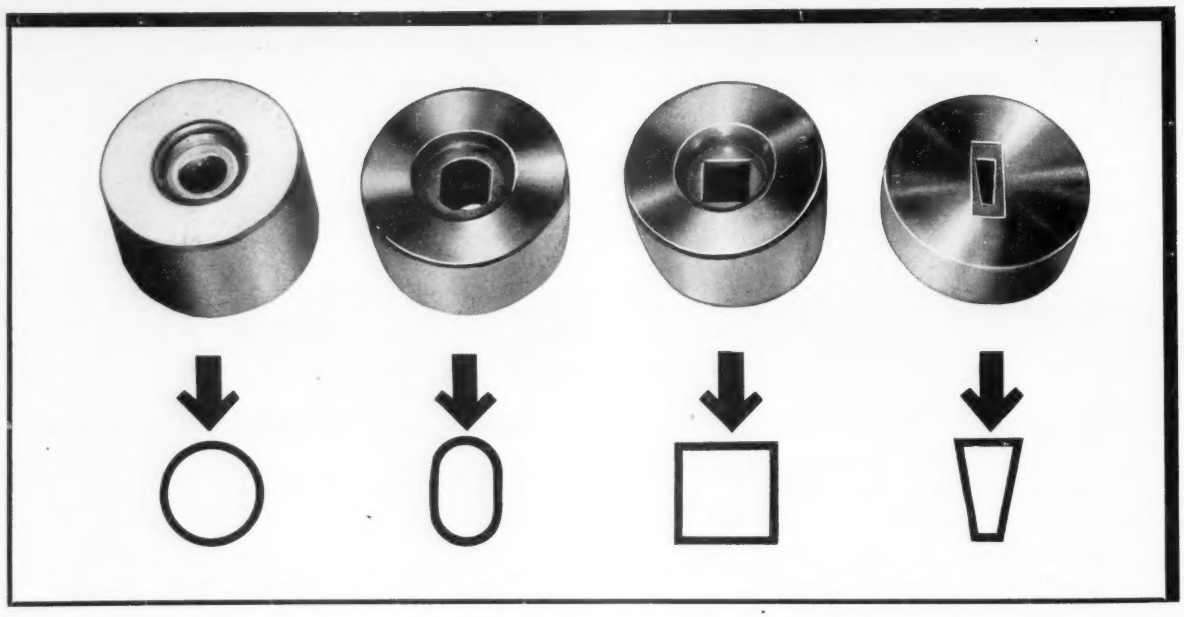

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WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip Wire Products and Insulated Wire and Cable

DRAWING—ROLLING—EXTRUDING—FORMING—FABRICATING

Vol. 10 October 1935 No. 10

Designated as

Official Publication By The Wire Association

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14½	94,330
14	* 69,770
13	93,350
12½	110,930
12	127,415
11½	* 64,220
11	131,755
10½	* 67,105
10	91,335
9½	* 59,130
8½	381,910
8	439,025
7½	460,355
7	347,370

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A monthly publication devoted to the production of Wire, Rod and Strip.
Wire Products and Insulated Wire and Cable.
DRAWING --- ROLLING--- EXTRUDING --- FORMING --- FABRICATING

Vol. 10 OCTOBER 1935 No. 10

Appraisals in Wire Mill Condemnation Proceedings

PART I

By Burt M. McConnell
New York, N. Y.

New York City's Tri-Borough Bridge Project Necessitated a Readjustment in Plant Layout, Material Handling and Production Processes of the Washburn Wire Company. An Outline of the Problems Presented is Given Here With the Final Determination. Published in Two Parts. ✦

IF it were necessary to justify the spending of $60,000,000 in building the Triborough Bridge, one could do so by flying over the greatest city in the world. What a panorama unfolds itself at four thousand feet! Ocean waves break lazily upon the narrow sandspits of Long Island. Automobiles creep along the highways, like so many beetles. A toy train puffs stertorously across the magnificent Hell Gate structure. As the sun struggles through the mist, the Hudson becomes a tiny ribbon of molten copper. Ferry boats, like so many water-bugs in a mill-pond, churn their way between the New Jersey shore and the metropolis. The new George Washington bridge across the Hudson looks as if it might have been spun by an industrious spider. We see the entrances and exits of the two vehicular tunnels under the Hudson. Three other bridges connect Staten Island with the mainland of New Jersey. Four others stretch from Manhattan Island to Brooklyn and Queens. But the Triborough does more; it connects Long Island and the mainland of the United States.

✦ ✦ ✦

THERE are plenty of bridges and tunnels, it would seem, yet the automobile congestion is

Wards Island. General view of foot bridge construction. View south from top surface of Wards Island tower. ✦ ✦ ✦ ✦ ✦

Designated as Official Publication by the Wire Association

simply frightful. What is the answer? Simply this: Once the older bridges were completed, the engineers and builders considered their job finished. No thought, apparently, was given to the problem of collecting the traffic at one end, and distributing it at the other. The modern bridge engineer, on the other hand, is something of a regional planner; it is his job to see that traffic flows over modern structures with the least possible amount of confusion.

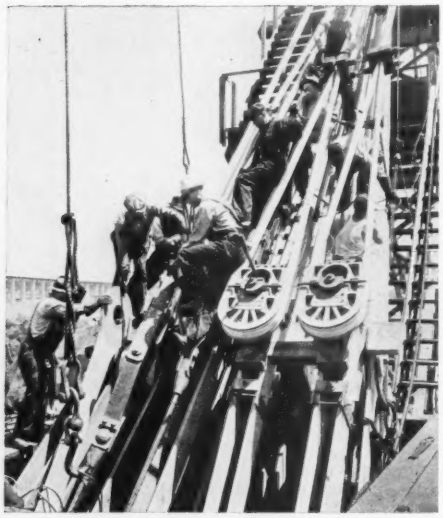
✦ ✦ ✦

where the East River meets Long Island Sound, men are swinging like spiders these cool autumn days, weaving a web that will one day support a broad highway. When finished, it will ease the traffic burden on the upper east side of Manhattan; it will link the elaborate parkway system of Westchester County with the millions of people living in Brooklyn and Queens. An ornamental parkway will skirt for two miles the edge of the East River.

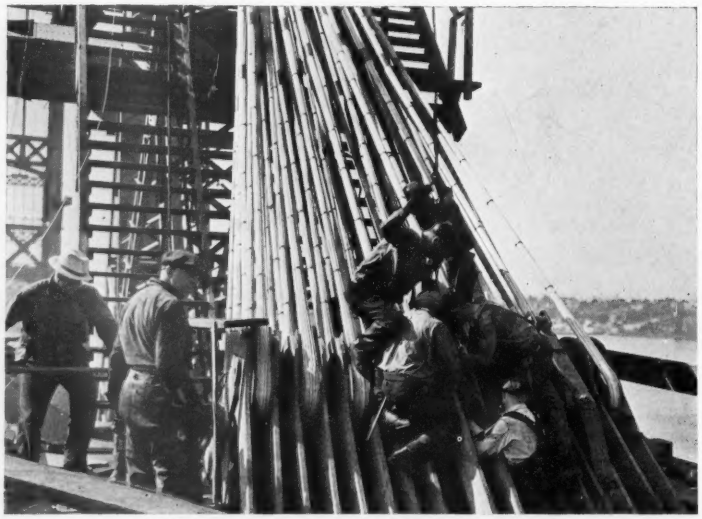
✦ ✦ ✦

Spinning the cables was a $762,000 job. They are now working on the suspender cables, most of them cut from the wires supporting the catwalk. The Triborough engineers estimate that the single deck, with its two 42-foot roadways, will meet all the traffic demands likely to arise in the next fifty years. This is 135 feet above the water, so that Navy vessels may experience no difficulty in getting from the ocean into Long Island Sound. The towers are 355 feet high.

✦ ✦ ✦



No. 1. East River Bridge. Strand shoe of strand of east cable being turned from spinning position to permanent position. ✦ ✦ ✦ ✦



No. 2. East River Bridge—Placing eyebar spaces in top row of eyebars at west cable spinning platform on Wards Island. ✦ ✦ ✦ ✦ ✦ ✦

IN the congested metropolitan district the solution of the traffic problem calls for the keenest analysis. The three Boroughs—Bronx, Queens, and Manhattan—may be considered as three great cities. (Three-fifths of the population of Greater New York have their homes in Brooklyn, Queens, and the Bronx.) The Triborough is exactly what its name implies; it bridges the waterways that separate the three boroughs. Stretching more than three miles, and spanning Hell Gate, Little Hell Gate, Bronx Kills, and the Harlem River, the new bridge is unique in the world in that it unites three great cities. It is really four bridges and a connecting thoroughfare, but it is all elevated, and they have it down on the blue-prints as a bridge. Above the swirling waters

IN the main cables of the suspension bridge over Hell Gate, 20⅝″ in diameter, there are 5,600,000 pounds of wire — enough to reach from the North Pole to the South Pole. The span is 1,350 feet in length, and the wire used in the main cables is cold-drawn steel wire, size .192. The rods were made by the **American Steel and Wire Co.**, at their Worcester mill, by the acid-open-hearth process, shipped to the Trenton plant of the same concern, and there drawn and galvanized. It required six months for the above company to turn out the rods, ship them to Trenton, draw and galvanize the wire, reel it, and transport it to the bridge site.

✦ ✦ ✦

THE towers and cables of the Hell Gate Bridge are the most conspicuous parts of the whole.

THE bridge over the Harlem River is of the vertical-lift variety, and is the largest of its kind in the United States, if not in the world. This type is exactly what its name implies; the entire span, 344 feet long, is lifted with cables, like an elevator.

✦ ✦ ✦

AT present the contractors all along the line are on schedule, and the plans of **Commissioner Robert Moses**, of the Triborough Bridge Authority, call for the opening of the 17 miles of bridges, viaducts, and traffic arteries by the first of July, 1936, in time for the Olympic tryouts. These are to be held at the new stadium on Randall's Island, one of the stepping stones.

THE Triborough is being financed through the sale of Triborough Bridge Authority bonds to the Government, in the amount of $35,000,000. These bonds will be redeemed, and the interest on the money paid, by toll charges. In addition, the Government, in order to stimulate industry and increase employment, is authorizing a grant, equal to 30 per cent. of whatever amount the Bridge Authority spends on labor and materials. This will amount to approximately $9,000,000. The difference between $44,000,000 and $60,000,000 (the estimated cost of the bridge) is represented by previous construction costs; and the acquisition of land for bridge, roadway, park, and other purposes.

✦ ✦ ✦

COLONEL **Paul Loeser** is the Director of the project, and **O. H. Ammann,** builder of the George Washington Bridge, is the chief engineer. There was no organization whatever on February 15, 1934, yet within two weeks the first contract was let. In the case of the bridge across the Hudson, two types of main cables were considered—wire cable and eye-bar. Wire cables were finally adopted, in preference to the eye-bar kind. In drawing up the specifications for the Triborough bridge, consideration was given only to wire cable.

FIRST of all, it was necessary to form a large engineering organization. Borings, surface engineering studies, and investigations were made. Hearings were held; legal and financial difficulties ironed out. Topographical surveys, river borings, and engineering and architectural studies were made. A suspension bridge over Hell Gate was decided upon because it was economical, aesthetically superior to any other type, and could be built high enough to suit the War Department. One division prepared drawings and estimates; another handled specifications, contracts, negotiations, and the preparation of agreements with the various outside bodies whose interests were allied with, or affected by, the construction of the bridge. There was a legal department and a real estate department. Progress pictures of the work were made by a staff photographer. A special sub-division was organized to plan the approaches.

✦ ✦ ✦

IN addition to the local inspectors of masonry and materials, there were others stationed at the various plants where materials were being manufactured and fabricated, such as the American Bridge Co., and the American Steel and Wire Co. The Port Authority's modern laboratory was used for testing concrete, steel, and castings. The construction work was divided into sixty different contracts. The fullest competition in bidding was permitted, and the award made in each case to the contractor who, in the judgment of the Bridge Authority, qualified as the lowest responsible bidder.

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ONE of the projects included in the whole is a 125-foot boulevard that will run alongside the East River from 92nd Street to 122nd Street, a distance of about two miles. This is expected to rejuvenate the upper East Side as Riverside Drive did the upper West Side many years ago. Among the properties affected by this improvement was that of the **Washburn Wire Co.,** which occupies the blocks fronting on the East River bounded by 117th, 118th, and 119th Sts. The roadway engineers needed a strip some 125 feet wide. The Bridge Authority engaged the **Perin Engineering Co.** to make a survey, and to estimate what amount of damage the Washburn plant would suffer by the radical change in its setup. At the same time, **Mr. Praeger,** one of the executive engineers, asked **Mr. Kenneth B. Lewis,** wire mill consulting engineer, to act for the Bridge Authority in the capacity of wire-mill specialist and arbitrator. Since there was a large amount of work to be done outside wire lines, such

No. 3. East River. Paying out operation of foot bridge ropes from barge.

No. 4. Wards Island. Strand framers for strands Nos. 9, 10, 11, & 12 of west cable in Wards Island anchorage bent saddle.

✦ ✦ ✦ ✦

as estimates on buildings, electrical wiring, foundations, and coal handling equipment, the Perin Co. took over the entire job and retained **Mr. Lewis** as consulting wire-mill engineer.

✦ ✦ ✦

AN estimate was made by **Washburn** executives of what the proposed disorganization of the plant would cost them—the additional cost of operating on separate floors, and so forth. The operations disturbed were of such a nature that they must be related to one another and to other operations. A vital part of the plant would be sliced off; there did not seem to be enough ground space left for economical operations. It was the job of **Mr. Lewis** to bring about agreement between the Bridge Authority, on the one hand, and the **Washburn Co.**, on the other. The difference between what the City was willing to pay for the 125-foot strip of land, and to offset the inconvenience to the wire mill's operations, and what the Washburn Co. was willing to accept, amounted to over a million and a half dollars.

✦ ✦ ✦

THE wire mill had the use of four docks; all material was received, and much of it shipped, by water. The two streets on the property, ending at the river, were, for transportation purposes, a part of the plant. The boulevard not only would eliminate the docks; it would turn these dead-end streets into busy approaches to the new roadway, and thus cut off the three units of the plant from each other.

✦ ✦ ✦

A TENTATIVE solution of the problem had been reached, but it was recognized as inadequate. Moreover, it involved claims for several times the amount the Triborough Authority felt justified in paying. The alternative was condemnation of the plant, removal of the business to another State, loss of profits, unemployment for 1,200 men, loss of taxes by the City—and all that these imply—followed by a suit for damages running into millions. The principals had reached an impasse.

✦ ✦ ✦

MR. LEWIS, at this stage, was able to persuade the roadway engineers to make a slight alteration in a curve to spare a large, five-story Washburn mill building, with all its heavy modern machinery. By arranging a dock that harmonized architecturally with the surroundings, he was able to persuade the City engineers to permit the Washburn Co. to have a dock that could also be used for storage and one of the primary steps in manufacture. Even with this concession on the part of the City, it would still be necessary to transport material from the waterfront to the plant over high-level bridges. All the steel processes would be subject to at least one round-trip by elevator; most of it would have to make from two to nine such trips.

✦ ✦ ✦

NOW, all wire-mill executives know that elevator transportation in a plant dealing with heavy material is a great breeder of costs, both direct and indirect. Congestion of traffic and delays around the elevator shaft tie up an incredible number of man-hours. Room to pass, room to maneuver at curves and at the elevator use up a great deal of floor space. Typically ground-floor operations would have to be handled on upper floors, at additional expense; transportation by elevator of much tonnage would considerably increase manufacturing costs. These and other considerations led the Washburn Co., quite properly, to include the above items in estimating the amount of their claim.

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ENGINEERS employed by the City, experienced in condemnation and appraisal work, saw the problem only in terms of square feet of land and of a few old one-story buildings; the Washburn executives, on the other hand, saw their highly integrated plant cut into three isolated segments, their access to the water front cut off, and their steel, coal, and finished product trucked to and from the plant through the congestion of New York's East Side. More than that, they faced the loss of their key departments, rod storage, cleaning, baking, patenting, and tempering. The authorities could see only the loss of a few old buildings; the company saw the virtual destruction of a great business. The arbitrator was faced with a two-fold task; first to interpret to the authorities the gravity of the situation into which the wire company was being forced, then to devise a way in which the plant could be saved without exceeding the budget.

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MR. LEWIS found that transportation was the key of the whole problem. Wire products involve units of 100 to 300 pounds, and successful and economical operations are predicated upon the massing of these units in lots of one to three tons, and their transport on industrial trucks. Elevator transportation was out of the question on the score of prohibitive expense and the use of floor space. Escalators involved great cost, the use of much floor space, the high cost of upkeep and repairs, and the fact that only comparatively small lots could be handled. Briefly, the problem was to transport material in truck lots, preferably on the trucks themselves, picking up the load at ground level, passing over streets and the boulevard with adequate clearance, and distributing the loads either at ground level or on the second floor. It was necessary that the transportation of these loads be screened from the view of motorists and others. They must be housed in structures that would harmonize with park and roadways of the high standard set by Park Commissioner Robert Moses, who in this case was the head, not only of the City's parks, but also of the Triborough Bridge Authority.

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How this wire-mill engineering problem was solved will be told in a second article by Mr. McConnell, who is one of the Wire Association's newest members.

Special Steels In Wire Form

By Richard Saxton
Works Manager, Sheffield, England

An analysis of the various treatments and methods of preparation required in working special steels in wire form. A digest of British practise. ✦ ✦ ✦

THOUGH a great deal of technical literature has been published in relation to Special Steels; their properties; and heat treatment essential to raise these latter to the highest efficiency, there appears to be a singular scarcity of information relating to these metals and their reaction to cold work when fabricated in wire or bar form.

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WHILE methods of production, both drafting and lubrication, follow usual procedure as applied to carbon steel drawing, the additional elements, and various percentages of those elements, necessitate a wider knowledge of heat treatment than essential for efficient carbon steel wire production.

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VARIATION in percentage of any element usually necessitates variation in heat treatment, and though to raise to a specified temperature and maintain at that figure presents little difficulty, the speed of heat penetration and the time allowance for carbides to pass into solution are factors which can make or mar the properties required in the steel.

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Special Steels

THE term "special steels" may be said to be misleading, for while it comprises a very wide class it is often employed to designate any particular steel employed for a special purpose, whether carbon or alloy quality. In this article it is applied to alloy steels only; i. e. steels deriving properties from elements other than carbon.

THOUGH a new era in steel production has been initiated by the introduction of alloy steels in stainless qualities, the success of the majority is due principally to inclusion of carbon in the composition, for there are few in which, apart from the special elements added, it would be possible to impart the properties derived without inclusion of this particular element.

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THIS fact is often overlooked when describing new steels where advantages claimed are said to be due to the addition of special constituents, for the majority are dependent, for the properties imparted, on the particular percentage of carbon included, combining with the iron and special elements incorporated.

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MICRO-constituents comprising alloy steels are precisely the same as in carbon qualities, but the inclusion of special elements facilitates the ease with which certain constituents may be produced, and though it is usual to express in terms of heat treatment and composition, the percentage of the stated constituents should be noted as a knowledge of these is equally important.

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ROUGHLY, only about seven or eight different elements find extensive application in the composition of special steels, each, in varying quantity, imparting special properties which may be heat or corrosion resisting; increased cutting efficiency; or improved response to magnetic or electrical influences. As heat treatment plays an important part in imparting each or any of these properties this process will be given first illustration.

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Heat Treating

AS to attempt to describe the heat treatment of each class or quality would entail space necessitating publication in book form, it is intended here to deal only with those in general use and give a description of the heat treatment essential to efficient plastic deformation, and for the elimination of detrimental stresses set up by the cold working method of production.

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BRIEFLY, alloy steels may be divided into two classes, austenitic and martensitic, or non-magnetic and magnetic, and while practically all of the former are amenable to reduction by cold work to some extent, few of the latter respond favourably to the pressure generated; the majority fracturing immediately tension is applied.

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Chromium Steels

AS the chromium stainless qualities find widest general use, a description of the heat treatment and cold working properties of the austenitic series of these metals and the various detrimental factors set up during process is here given.

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Cold Working

REDUCTION by cold work in bar or wire form is by circumferential pressure induced by the pull as in high carbon and mild steel drawing, and while it is possible

to reduce certain compositions with drafting equaling that of high carbon steel reduction, the general practice is to reduce approximately one size per draft.

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THOUGH it is possible to reduce some qualities deeper, the average reduction is two passes between annealings in the thicker sizes; this combination of cold work and heat treatment imparting a more homogeneous structure and less liability to cross-sectional stress than is possible with the greater depth of reduction as mentioned.

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CHROMIUM steels amenable to reduction by cold work, (austenitic series), invariably contain nickel in excess of 6%, added chiefly to impart additional mechanical strength and not, as generally supposed, to assist the corrosion resisting properties. Chromium content is never less than 14% in this series, and though milder than the martensitic qualities in the finished condition, as a class this series is more resistant to general corrosion conditions.

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THE following (see table A and and table B) are three compositions of both series which find a wide general use in their respective spheres.

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ALL steels in the second series can be hardened by heat treatment, which differs in accordance with the composition of the material and the result essential to be achieved. Heat treating consists in raising to a temperature of 950-1000 degrees C. and quenching in oil or water. Tempering temperature is dependent on the purpose for which intended; for pump rods, etc., 600-750 degrees C.; edged tools, necessitating greater hardness, 200-300 degrees C.

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Rustless Iron

RUSTLESS iron, a more expensive metal than the steel, has a composition containing roughly, about 0.1% carbon. It possesses a marked malleable nature and responds to plastic deformation as easily as annealed mild steel. Its mechanical properties make it extremely suitable for fabrication into wire, but due to the high initial cost its employment in wire form in many suitable spheres is an uneconomic proposition.

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Temperature Control

HEAT treatment of chromium steels, and practically all alloy steels, requires careful regulation both during the rise in temperature and the soaking period, and unless efficiently performed further work on the material is useless, ending ultimately in the scrapping of the metal. Due to greater density and lower thermal conductivity compared with carbon steels, speed of penetration by heat is approximately ⅓rd that of the latter steels, and forcing or rapid rise of temperature results in inter-granular corrosion or longitudinal cracking of the surface structure on cooling.

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Heat Treating

WHEN heat treating or annealing alloy steels a much higher temperature is essential than is requisite for carbon qualities; a temperature necessary to enable carbides to pass into solution and also eliminate cross-sectional stresses set up by previous work. Temperature essential with the majority of this class is 1100 degrees C. As chromium steels are generally preferred for their stainless properties a few of the defects liable to lead to corrosion trouble are illustrated.

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Defects Leading to Corrosion

THE mechanism of corrosion is not as yet, fully understood, and although various theories have been advanced in explanation of the cause, nothing definite has yet been proved. Unless efficiently treated in every process of production chromium cold worked steels are litle superior to carbon steels in corrosion resistance. The essential condition is a stable, adherent, insoluble oxide film, and factors adverse to this condition are primarily due to wrong thermal treatment, physical differences and impurities in the metal.

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AS, with this type of steel, heat treatment is more apt to err on the under than over-heating side, the relation of under-heating to corrosion is here given. All cold worked steels at the conclusion of the drawing or cold working operation are in a condition of internal stress, which can only be realized by suitable heat treatment or by the removal of the outer skin as in precision grinding.

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WHERE a steel is in a condition as illustrated a difference of potential is set up, and in this state

TABLE A
AUSTENITIC CHROMIUM STEEL
(AMENABLE TO COLD WORK.)

	Carbon.	Manganese.	Silicon.	Sulph.	Phos.	Nickel.	Chromium
No. 1	0.10%	1.00%	0.95%	.035	.035	10.5%	18.0%
No. 2	0.30%	0.50%	1.00%	.035	.035	8.0%	21.5%
No. 3	0.45%	1.5 %	2.50%	.035	.035	26.0%	20.0%

TABLE B
MARTENSITIC CHROMIUM STEELS
(NON-AMENABLE OR DIFFICULT TO COLD WORK.)

	Carbon.	Manganese.	Silicon.	Sulph.	Phos.	Nickel.	Chromium
No. 1	0.35%	1.00%	0.40%	.035	.035	1.00%	12.0%
No. 2	0.15%	0.60%	0.50%	.035	.035	2.50%	12.0%
No. 3	0.25%	1.00%	0.60%	.035	.035	3.00%	17.0%

corrosion, under favourable conditions, commences to take place. This action is engendered by the stressed material becoming electro-positive to that of the non-stressed, and produces a galvanic couple in the presence of an electrolyte. It is possible to eliminate these stresses by prolonged tempering at 100 to 150 degrees C., or where the material is not required to be of a specified hardness it can be totally eliminated by prolonged normalising at 800 degrees C.

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LOCALIZED corrosion troubles are principally due to inefficient removal of surface impurities such as scale, etc., during acid cleaning operation. These, drawn into the metal during its passage through the die, cause minute indentations in the surface metal which, filled in and covered over by the later polishing operation, ultimately on ageing fall away and leave a rough grain surface favourable to a corrosion condition.

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Grinding

THOUGH grinding is usually employed to reduce the material in bar form to finer limits than is possible with the drawing method, unless the material is previously conditioned by normalising, distortion is liable to occur by the released stresses adjusting themselves to a state of equilibrium immediately the skin is removed. Where practicable grinding should never be attempted in the "as-drawn" condition as, apart from the change as illustrated, the operation results in excessive wear and probable damage to the wheel.

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SPEED of travel is an important factor in the efficient grinding of special steels, and must be so graded that the heat generated is spread over as wide an area as possible; too slow a speed will result in local heating and conseuent distortion. The rate of speed varies with material diameter undergoing process.

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Nickel Steels

THOUGH one of the earliest alloy steels, nickel still commands a wide use in the production of certain commodities for which it is particularly adapted; especially products necessitating case hardening. A further feature is the ease with which it can be forged and rolled when under 5% nickel content.

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Heat Treating

EFFICIENT heat treatment of nickel steels necessitates in addition to the heat application, experience and a knowledge of the change points; for it possesses the property of reducing the critical point of iron; each 1% of nickel up to approximately 8% reducing the Ac_1 point 8 to 11 degrees C., and the Ar_1 point 16 to 22 degrees C.

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Cold Working

COLD working of nickel steels, (conversion by drawing into wire, bars, or tubes), follows the usual practice employed in the fabrication of special steels, the bulk of the drawn material being produced from compositions varying from 2 to 4% nickel and 0.2 to 0.5% carbon. Resistance to corrosion is higher than that of carbon steels and increases with the increase of nickel content. While fairly resistant to plastic deformation in the earlier stages, it reduces easily after one or two annealings, and apart from rapid hardening during deformation presents few difficulties if well soaked during thermal treatment.

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Nickel-Chromium Steels

THE combination of nickel and chromium produces what may be termed the best universal steel for commercial purposes, furnishing a metal combining malleability with great ductility. A ratio of 1% chromium to 2.5% nickel imparts high physical properties, and by slightly varying the composition of the two elements and confining manganese and carbon within limits, a wide range of tensile strength is possible in the heat treated condition.

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THe addition of 8% nickel to 18% chromium produces enhanced resistance to corrosion and renders the material incapable of hardening by quenching. This composition, in the soft or annealed condition, responds favourably to cold work production in wire or tube form, and furnishes a smooth surface highly suitable for polishing.

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Heat Treatment

CHARACTERISTICS of this type of N. C. steel are high ductility, toughness, and resistance to impact. Under repetition of cold work such as a third or fourth consecutive draft it hardens up rapidly, and the best practice is to anneal after each second or third pass. General heat treatment to anneal for further cold work is to raise to 1100 degrees C. and chill in water.

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IT is possible to soften or normalise by heating to 800-950 degrees C. and cooling slowly in air, but this practice fails to eliminate the stresses set up by previous cold work, and any attempt to draft beyond one pass often ends in a brittle and unstable structural condition. In heat treating nickel-chromium steels of the foregoing type, (18.8), the rise in temperature should be carefully noted, as any prolongation of the period between 500 and 800 degrees C. being liable to lead to a condition of inter-granular corrosion.

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THE addition of molybdenum to N. C. compositions not only enhances the ductility, but also intensifies the hardening properties of the other constituents present. Tools or units fabricated from N. C. molybdenum compositions offer great resistance to tempering, a property of value where maintenance of strength and hardness is essential when working at high temperatures.

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High Speed Tool Steels

OF all alloy steels none deserve better the term "special" than the high speed series, for they are deservedly in a class of their own. These steels are mostly members of the quaternary or complex family; i.e. their composition includes three special elements essential for the properties desired. Two essential factors of this class of steels are:—

(1) High resistance to heat developed by friction.

(2) Resistance to wear and severe service conditions.

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RESEARCH and experimental work have proved that the best results, (cutting efficiency) are obtained with a composition of approximately 3% chromium and 18% tungsten. Molybdenum up to 1% is included in some compositions, but such inclusion is not general as molybdenum is apt to deteriorate under repeated heating.

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Drawing Tool Steels

REDUCTION by drawing of high speed tool steels follows the usual practice as employed in high carbon steel reduction, but in the first stages in wire form is often accompanied by difficulties in reducing without fracture, the material, though annealed and fairly mild when tested by hand, offering stubborn opposition to the pressure imposed.

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THIS is assumed to be due to a variation in grain structure imparted during the hot rolling operation and, where combined with irregular cylindrical formation, makes the reduction without fracturing a difficult proposition during the early stages. Resistance to deformation declines with each two drafts and intermediate annealing, the material forming a more homogeneous structure under the combined influence of cold work and heat treatment until, after the third treatment, further reductions present little difficulty.

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Cobalt

THE addition of cobalt imparts the property of super-hardening under pressure, but due to the high cost of production, cobalt steels find a more economic use as tips to cutting tools fabricated from cheaper steels. Microscopic examination of these steels in the annealed condition reveals the structure as a matrix of solid solution of tungsten and iron with globules of carbides. For the development of full cutting powers these steels must be heated to 1300 degrees C. to ensure the carbides passing into solution, then quenched in oil or air, followed by draw tempering.

Intermediate Heat Treatment

INTERMEDIATE heat treatment for cold working, as distinct from initial or final treatment for hardening, consists of normalising at 800-850 degrees C., and cooling as slowly as possible, preferably with furnace. Steels containing 8 to 13% cobalt give excellent service as draw dies, their increased resistance to wear under heat generated during drawing rendering them extremely efficient in this particular sphere.

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HEAT treatment of high speed, and in fact of all alloy tool steels is practically the most important operation in the fabrication of the metal, for the properties essential in the finished article or tool can be eliminated or impaired by inefficient performance of this particular operation.

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RATE of penetration by heat and, incidentally, elimination, is markedly slow compared with the treatment of carbon qualities, the carbides going into solution very slowly on heating and vice versa on cooling. Time as well as temperature is essential for successful treatment.

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Hardening and Tempering

IN hardening and tempering these steels this point is often overlooked, with resultant inefficient soaking and the surface carbides only passing into solution, leaving the structure on cooling in a state of unequal stress and with a liability to fracture immediately pressure is applied. To ensure proper soaking the material should be allocated one hour per inch of diameter on attaining specified temperature, any risk of scaling or decarburisation being countered by adjusting the furnace to give a slight carburising atmosphere.

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AS previously stated "slowness" of alloy steels in absorbing heat is due to their lower thermal conductivity and greater density. A factor which should never be overlooked is that time is equally essential in the tempering operation as in heat treating, for in this process, essential to ease or release stresses set up by the chilling, tension is eased at a much slower speed than heat is absorbed. One half-hour per inch of diameter should be the minimum time allocated to tempering.

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Molybdenum Steels

THOUGH the chief value of molybdenum is stated to lie in its intensifying properties when incorporated with other elements, it is remarkably amenable to deformation by cold work and, where included in chromium compositions, imparts easy flow to the metal during forging or hot rolling. It also possesses the property of extending the range of both hot and cold working, and increases the penetrative effect of hardening.

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Drawing Molybdenum

DRAWING practice for reduction in wire form follows generally that of high carbon steel fabrication, with the exception that in the finer sizes the depth of reduction per pass is slightly easier. In steel strip and cold drawn tube form this steel is finding an ever increasing application in air-craft construction, while steels with an average content of 1.5% chromium and 0.5% molybdenum have a wide use in Europe due to their oxidation resisting properties.

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Heat Treatment

HEAT treatment, intermediate or normalising, follows the general practice used for the majority of alloy steels except where fabricated in cold drawn tube form to comply with British Standard Specifications relating to crushing, flattening and hydraulic tests. To conform to the foregoing, the process on completion of the drawing operation is to heat to 850 degrees C. and then allow the temperature to fall slowly within the furnace to 650 degrees C., when the material can be unloaded and allowed to cool in air.

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Nickel-iron Alloys

THOUGH employed principally for specialised purposes, nickel-iron alloys are finding an ever widening application in general electrical and mechanical engineering. From the wire drawing or

(*Please turn to page 488*)

The Effect of Heavy Oils and Greases on the Fatigue Strength of Steel Wire

By R. Goodacre, B.Sc., Ph.D.

Bruntons (Musselburgh) Ltd., Musselburgh, Scotland

Recently, a survey has been made in the Research Laboratory of Messrs. Bruntons (Musselburgh), Limited, of various makes of oils and greases marketed and used for the lubrication and filling of wire ropes. This was carried out with a view to finding out the best type of oil or grease for this purpose.

IN connection with this investigation it was suggested that, among other tests, an investigation should be made of the effect of these oils upon the fatigue properties of cold-drawn wire as used in ropes and cables. It was expected that some of the greases might set up corrosion fatigue conditions, which should be avoided, although it might be assumed that, provided the material contains no corrosive constituent, the fatigue properties of the wire would not be altered. Lehman quotes among results of tests carried out under corrosion conditions that lubricating oil at 17 deg. C. had no effect, but no details of the oil are given.

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IN the tests made in this investigation, no corrosion fatigue was noticed, but quite a different effect was observed, and it is felt that this is not only of importance to users of wire ropes but to users of lubricants in general, as some of the oils investigated are used for lubrication of the moving parts of machinery. The general effect noted is that the limiting fatigue strength of the material is increased when coated or submerged in oil or grease, but the degree of improvement depends upon several factors which will be discussed below.

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THE fatigue machine used for these tests was the new Haigh-Robertson fatigue-testing machine. A box was attached to the bed plate of the machine to hold the oils and greases and prevent undue splashing. For the lighter oils, a drip feed was required, but for the heavier oils and greases it was found that smearing of the test specimens at the beginning of the tests was quite satisfactory. The standard wire used for the tests was of 0.55 per cent. C. content having been drawn 75 per cent. reduction to 0.080 in. diameter. Its tensile strength was 94.5 tons per square inch, and its limiting fatigue strength in air, ±23.7 tons per square inch. The oils and greases used were a comprehensive selection from both British and American manufacturers. They all contained a bitumen base, but, in addition, some of them (D, H, I and L as indicated in Table I) contained fillers. The composition of these fillers was not determined, but in two cases seemed to be of a fibrous nature.

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THE fatigue strength (reverse bending) of the wire in the drawn condition, when coated with or immersed in the various oils and greases, are given in the fourth column of Table I. It will be seen that the maximum figure obtained is ±27.6 tons per square inch (with oil I) an increase of ±3.9 tons per square inch compared with the fatigue strength as measured in air, or 16.5 per cent.

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IN Fig. 1 these fatigue values are plotted against the log of the viscosity number for the respective oils. It must be explained that the viscosity numbers (given in the

Fig. 1.

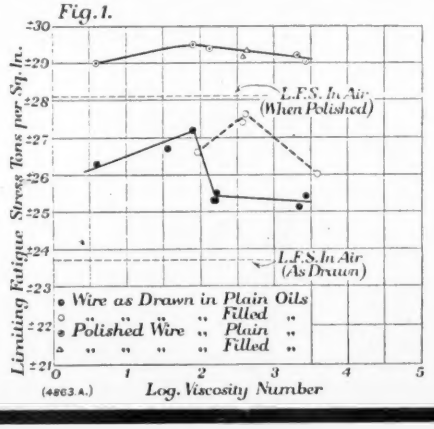
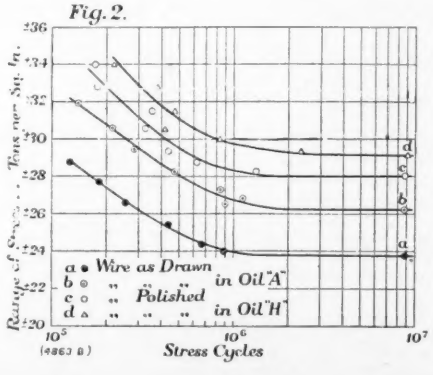


Fig. 2.



second column of Table I) are not the usual figures given for oils and greases, but are results from a test specially devised for the testing of rope oils and greases in which an attempt has been made to simulate practical conditions. This viscosity number represents the time in seconds to force 1 c.c. of the material through a hole 1.585 mm. minimum diameter under a constant load of 0.70 kg. per square centimetre at room temperature. It differs from the usual tests in that it is carried out at room temperature, and under pressure. Nevertheless, it gives a measure of the viscosity and is a good method for comparing the oils and greases from a rope maker's point of view. Referring to Fig. I, it will be seen that the fatigue properties improved with increasing viscosity of the oils up to a certain point, after which there is a rather marked fall, and from this point the limiting fatigue stress is practically constant or falls slightly. A marked maximum occurs with the oils containing fillers (shown in the dotted curve) but in this case the maximum is reached at a higher viscosity.

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THE effect of atmospheric oxygen on the fatigue properties of metals has received considerable attention during the past five or six years from a point of view of the part it plays in corrosion fatigue. In 1928, **Binnie*** suggested that oxygen is a factor in corrosion fatigue. In 1929, **Speller and McCorkle†** did a considerable amount of work on the effect of inhibitors, and concluded that the stability of the protective surface films formed by inhibitors is a factor in the prevention of minimising of corrosion fatigue. In 1930, **Haigh and Jones‡** showed that, in the case of lead and lead alloys, immersion in oil delayed the fatigue failure for a given stress when compared with a specimen tested in air, and to a lesser degree the same effect was obtained with a layer of grease on the specimen. In his Autumn Lecture before the Institute of Metals in 1932, **Gough*** summed up the position of the knowledge of corrosion fatigue, and collecting the data obtained by many workers throughout the world, pointed out that the inconsistencies between the various published results could be explained if it were realised that the oxygen of the atmosphere was a very important factor in corrosion fatigue. Then followed a paper by **Gough and Sopwith†** which showed that the oxygen of the atmosphere by itself causes slight corrosion fatigue. The results given were from tests carried out *in vacuo* and for test pieces smeared with lanoline. It was shown that for a 0.5 per cent. C. steel the ratio of limiting fatigue stress *in vacuo* to the limiting fatigue stress in air was 1.03, or an increase of 3 per cent.; for a mild steel the increase was 5 per cent. and for brass a larger increase was recorded. With lanoline there was a possible slight improvement but it was considered to be negligible, the investigators considering that lanoline offered no real protection from the air. In the discussion it was pointed out by **Professor Desch** that at the reduced pressure used by **Gough and Sopwith**, many millions of oxygen molecules would still exist round the test piece, and it was suggested that under a more perfect vacuum the fatigue strength would probably be higher.

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IT might be thought that this gave the answer to the effect of oils and greases in raising the limiting fatigue stress in bending, but it is felt that the increases obtained are not explained solely by the exclusion of the oxygen of the air by the oil, and that probably there is another factor to be considered.

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THE wire used for these tests was in the "as drawn" condition, and consequently the surface contained die marks and other blemishes. These surface marks are common to all cold-drawn wire as it is impossible to avoid them when wire is drawn on a commercial scale, but they are not usually detrimental unless very bad, in which case they are easily discovered in the routine tests, such as bends and torsions made on the wire after drawing. When wire is used for special purposes, for example, the manufacture of springs, it is usual to specify polished material, in which the surface marks have been removed. It is well known that the surface conditions modify the fatigue properties to a certain degree, and it has been shown that this applies to cold-drawn wires. It is assumed that surface blemishes such as die marks cause local concentration of stress which cannot be evaluated, and hence the apparent fatigue strength of the material is lower, especially under reverse bending and torsional conditions.

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THE possible reason for the large increase in fatigue properties caused by heavy oils and greases is that, in addition to keeping away atmospheric oxygen, it helps to fill up the small surface markings, thereby minimising the concentration of stress to a certain extent. The evidence supporting this contention is as follows:— There is a maximum increase in fatigue strength occurring at a certain viscosity which suggests that above this critical viscosity figure the oils and greases cannot flow easily into the small surface marks. Oils and greases containing fillers enhance the fatigue properties still more, and it is suggested that the filler helps to fill up the drawing marks, etc., thereby adding to the efficiency of the oil. The oil in these filled materials is of fairly low viscosity, and could not have caused the increase by itself.

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IN order to test further this suggestion, it was decided to carry out tests using the same wire but in a polished condition, that is, after die marks and surface defects had been removed. The limiting fatigue stress in air of the

* Engineering, vol. cxxviii, pages 190-191 (1929).
† A.S.T.H., 1929.
‡ Jour. Inst. Metals, 1930, vol. xliii, page 271.
* Jour. Inst. Metals, Autumn Lecture, 1932.
† Jour. Inst. Metals, 1932, pages 93-122.

material after polishing is ±28.1 tons per square inch, and it is interesting to note in passing that with oil I the limiting fatigue stress of the wire in the "as drawn" condition, nearly reaches this figure, being ±27.6 tons per square inch.

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THE limiting fatigue stress is improved when the polished wire is coated with heavy oils and greases, increases from ±0.9 ton to ±1.5 tons per square inch being noted (see Table I, col. 5). In this case it is probable that the increase is due solely to the exclusion of atmospheric oxygen as the surface defects on the wire have been removed. The limiting fatigue stress is raised by 3 per cent. to 5 per cent. which corresponds to the values obtained by **Gough and Sopwith*** in their tests made *in vacuo*. This raising of the limiting fatigue stress is approximately the same for all the oils and greases tested, including those with fillers. In this case the fillers probably play no part, and only the oil is responsible for the exclusion of atmospheric oxygen. However, there is an indication that a maximum value for the viscosity of the oil exists for obtaining the best protection, as shown in the top curve in Fig. 1.

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A FURTHER interesting point is the improvement of the fatigue properties for stresses above the limiting fatigue stress. This will be seen by reference to Fig. 2 where curves are given for:—(1) Wire as drawn. (2) Wire (as drawn) when covered with oil A. (3) Wire in polished condition. (4) Wire (polished) when covered with oil H.

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IT will be noticed that the pairs of curves *a* and *b*, and *c* and *d*, run practically parallel for their entire length. This effect was noted with all the oils and greases tested, and this is similar to the results obtained with lead by **Haigh and Jones.*** This shows that the raising of the fatigue strength is due to the oil, otherwise a modification to the shape of the fatigue curves would be expected.

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THE raising of the endurance at stresses above the fatigue limit is of importance to users of wire ropes. Wire ropes are often overstressed when in service, and a knowledge of the endurance at these high stresses is important; in fact, it is considered that a knowledge of the stress to give, say 125,000 repetitions before fracture is of equal importance to that of the limiting fatigue stress. Referring to Fig. 2, curves *a* and *b*, it will be seen that the wire is the "as drawn" condition has a life of 125,000 stress cycles at a stress of ±28.8 tons per square inch, but when it is covered by oil A, the stress can be raised to ±32.2 tons per square inch to give the same life, and with oil I the stress is of the order of ±35 tons per square inch.

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HOWEVER, as mentioned at the beginning of this article, the effect of oils and greases upon the fatigue properties is not only of interest to users of wire ropes but to general users of lubricants, especially if by choice of a suitable oil the effect of surface blemishes, etc., can be minimised, and interesting results from further research should be obtained.

TABLE I.

Oil.	Viscosity Number.	Log Viscosity Number.	L.F.S. (Tons per Square Inch) Drawn Wire when Covered with Oil.	L.F.S. (Tons per Square Inch) Polished Wire when Covered with Oil.
A	4	0.60	± 26.3	± 29.0
B	38	1.58	± 26.7	—
C	84	1.92	± 27.2	± 29.6
D*	93	1.97	± 26.6	—
E	154	2.19	± 25.3	± 29.4
F	159	2.20	± 25.3	—
G	163	2.21	± 25.5	—
H*	373	2.57	± 27.4	± 29.2
I*	450	2.61	± 27.6	± 29.3
J	2,235	3.35	± 25.1	± 29.2
K	2,695	3.43	± 25.4	± 29.0
L*	3,980	3.60	± 26.0	—

* Containing fillers.
Fatigue strength in air of wire as drawn ± 23.7 tons per square inch.
Fatigue strength in air of wire when polished ± 28.1 tons per square inch.

TABLE II.

Wire as Drawn.		Wire (as Drawn) with Oil A.		Wire Polished.		Wire (Polished) with Oil H.	
Range of Stress. Tons per Square Inch.	Stress Cycles.	Range of Stress. Tons per Square Inch.	Stress Cycles.	Range of Stress. Tons per Square Inch.	Stress Cycles.	Range of Stress. Tons per Square Inch.	Stress Cycles.
± 28.8	126,000	± 31.9	139,000	± 34.0	171,000	± 34.0	220,000
± 27.7	182,000	± 30.6	217,000	± 32.8	175,000	± 32.8	380,000
± 26.6	237,000	± 29.5	284,000	± 31.7	355,000	± 31.7	463,000
± 25.4	431,000	± 28.3	472,000	± 30.6	327,000	± 30.6	412,000
± 24.4	662,000	± 27.4	827,000	± 29.4	436,000	± 30.0	848,000
± 24.0	873,000	± 26.9	1,111,000	± 28.8	630,000	± 29.4	2,379,000
± 23.8	10,000,000+UB	± 26.6	1,886,000	± 28.3	1,347,000	± 29.2	10,000,000+UB
—	—	± 26.3	10,000,000+UB	± 28.1	10,000,000+UB	—	—

Airplane Tie Rods

By Jack Delmonte

Electrical Engineer, Naval Aircraft Factory, Philadelphia, Pa.

The author was graduated from N. Y. U. with a B. S. in Electrical Engineering and from M. I. T. with a S. M. in Electrical Engineering. At present is junior electrical engineer at the Naval Aircraft Factory, Philadelphia, Pa., engaged in the design and development of electrical equipment for naval aircraft. ✦

AIRPLANE tie-rods or tie-wires may be found upon aircraft, fulfilling numerous structural purposes. Physically, they may be divided into two groups: the internal type and external type.

✦ ✦ ✦

THE internal type may be found inside of the airplane, protected from the airstream and brunt of the atmospheric conditions; the external type used on the outside of the airplane such as the wires found on the wing structures, are subject to more severe service conditions. Combining high strength and a maximum resistance to corrosion, these tie-wires must conform to rigid requirements.

✦ ✦ ✦

THE illustrations in figure 1 indicate the completed tie-wires. The screw threads are all National Form thread with a class 3 fit. The streamlined section is essentially elliptical or lenticular in cross-section. Reference to figure 2 will call attention to the fact that it is highly important to reduce the drag of an airplane by streamlining the exposed members.

IN specifying the length there are usually two dimensions that may be referred to. The first possibility is the rod-length, which takes into account the over-all length of the rod, and the second refers to the pin center length, which is the measured distance between the center of the pin holes of the tie-rod terminals.

✦ ✦ ✦

COMMERCIAL manufacturers are generally given the second specified length as it can be measured generally, from the airline installation. However, to avoid any confusion, when a length of tie-rod is specified, it should be stated whether or not it is the rod-length or pin center length.

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TABLE I gives a number of the standard sizes of tie-rods and the ultimate strength of the formed portion of the tie-rod (not the threaded part). In a second column are given average values of the number of test bends the tie-rods must withstand. The data are applicable to both the internal and external types.

✦ ✦ ✦

Reduction

THE reduction to the round or square section of the internal tie-wire type may be performed by rolling, drawing, or swaging. The reduction to the streamlined type may be performed by rolling and drawing, excluding the swaging.

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Testing

OF the tie-rods that are submitted for test purposes the reduced section is submitted to the bend test. The jaws of the bend test machine are rounded to about three times the minor axis of the reduced section of the tie-rod, and the wire is forced to follow the radius of the jaws and make a full 90 degree bend.

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Corrosion Resisting Coatings

OF equal importance is the corrosion resisting property of the tie-wires, for the frequent salt atmosphere in which airplanes fly

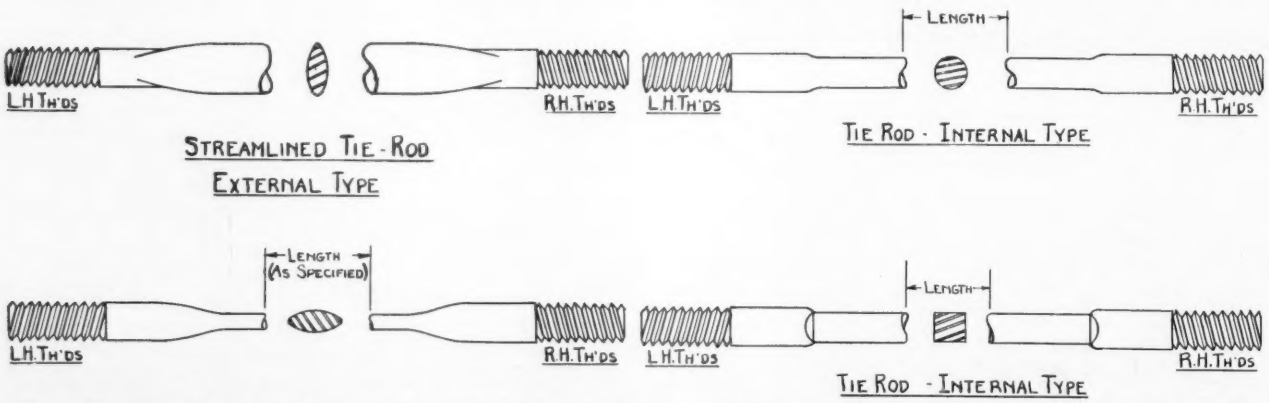

Fig. 1. The completed tie-wires. The screw threads are all National Form thread with a class 3 fit. ✦ ✦ ✦ ✦ ✦ ✦

necessitates careful attention to this problem. Consequently, the common corrosion resisting coatings may be found upon the airplane tie rod. Under the combined conditions of stress and corrosion, efforts must be made to eliminate, or at least delay the reduction of fatigue limit of the metal, produced by corrosion.

✦ ✦ ✦

RECENT investigations in England[1] disclose the protective values of various types of coatings applied to streamlined steel wire. Among the surface treatments to wire simultaneously subjected to fatigue and salt water corrosion spray are enamel (with and without cadmium plating), boiled linseed oil over cadmium plating, parkerizing, and aluminum spray by Schoop process, galvanizing and sheradizing. The best results were experienced with the last two treatments.

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OPINIONS differ in the United States, for it is the belief that cadmium plating is superior as a corrosion resisting coating on airplane tie-wires. However, corrosion resisting steel may be found upon some of the more recent tie-wires (18-8 steel is used).

[1] Engineering July 12, 1935, p. 45.

✦ ✦ ✦

New Equipment For Rubber Covered Wire

NEW equipment incorporating a Spark Testing Outfit has been developed recently by the **American Insulating Machinery Co.**, of Philadelphia, Pa., under a Patent Applied for by **Ralph L. Davis**, which the manufacturer states will permit the makers of rubber covered wire to combine several operations in the factory at a considerable saving in time and labor cost, and which will do the following:

1—Depan rubber covered wire after vulcanization,

2—Stop automatically if wire tangles when leaving pan,

3—Measure total length of wire and, if desired, stop on reaching any predetermined length as measured by an auxiliary dial,

4—Check diameter of covered wire for over or under size insulation, stopping automatically in either case,

TABLE I

Size & Thds.	Ultimate Strength (pounds)	Bend Test (average) (No. of 90° bends)
6—40	1000	11
10—32	2100	11
¼—28	3400	9
5/16—24	6100	7
⅜—24	8000	7
7/16—20	11500	6
½—20	15500	6
9/16—18	20200	6

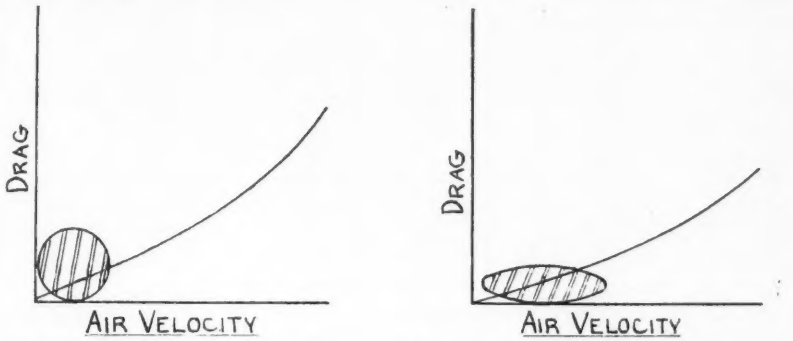

Figure 2. Reduction of drag by stream lining.

THUS, while airplane tie-rods fall under the category of wire products, there is a considerable more effort put into the wire and rod before the finished product is ready. Realizing the importance of high quality units to aircraft, one can not fail to see the necessity for the precautions described herein.

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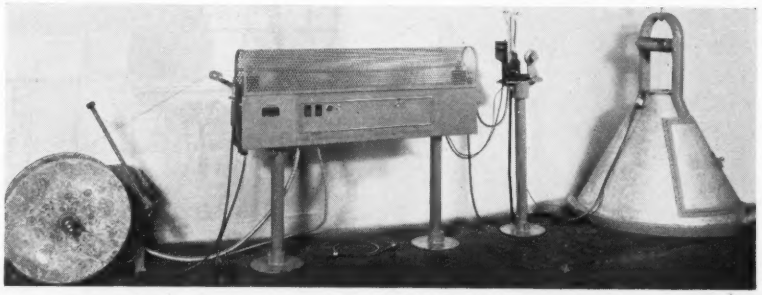
THE author invites attention to the fact that all opinions expressed herein are of a personal nature, and must not be construed as being presented in an official capacity. For further detailed information on the dimensions of airplane tie-rods, the S.A.E. handbook and government specifications may be cited.



5—Spark test rubber insulation for faults,

6—Wind the wire on a reel mounted on a motor driven ball bearing reel stand equipped with traverse motion, the motor, which is also ball bearing, being automatically stopped by a quick acting solenoid brake actuated when the end of the wire is reached.

SELECTION of voltage for spark testing is obtained by a multiple point snap switch, the current being limited so as to be harmless to the operator, should he by accident make physical contact.

THE Outfit is available complete or in part, as may be required in different departments in the factory, where the only requirements are of such a nature as measuring wire for production or in lengths for shipment, rewinding, checking for diameter, or final spark testing, thus simplifying other inspection.

✦ ✦ ✦

A BALL bearing mounted let off Stand with automatic brake can be supplied to accommodate reels when the wire is vulcanized on metal reels.

Firthaloy Introduces The "Diagraph" At New Die Plant Opening At Hartford, Conn.

ON September 7th New England and New York users of Firthaloy dies were invited to attend the formal opening of a new die shop in Hartford. The equipment all newly built is installed in the Firth-Sterling Steel Company's Hartford warehouse at 410 New Park Avenue, and will be used not only to make and service Firthaloy dies locally, but also as a show room for Firthaloy die making machinery which the Company sells with other die room equipment.

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THE branch plant will not make the sintered carbide at Hartford, but is equipped to do all necessary operations in finishing blanks made at McKeesport, Pa.

✦ ✦ ✦

ONE new device shown was the "Diagraph", which is an instrument on the Pantigraph principle, that instantly records on a magnified scale the exact contour of the inside of a drawing or extrusion die. It is used for checking finished dies and for studying the effects of operation or wear.

ON new applications a preliminary study of the contours of dies previously used is a starting point from which the die engineers develop new contours. The experimental dies in turn are "diagraphed" before and after using, permitting comparisons of the effect of modifications on wear, die life and the finish of the product. This Diagraph, which is said to be the only one of its type in this country, is used on larger dies. On small dies a projectoscope or shadowgraph is used.

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THE mechanical equipment consists of small batteries of rippers, polishers and finishers designed by Firth-Sterling engineers for working sintered carbides. There are also the usual shop tools for making special casings and sizing or truing the Firtheld casings, in which Firthaloy sintered carbide or "hard metal" nibs are welded or fused by the Firtheld process.

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THE new rippers have been improved by the addition of several features. An enclosed mercury switch automatically starts the spindle as the needle is advanced into a die and stops the machine when it is withdrawn. This switch is mounted on the spindle arm, making its action automatic. A new stroke control attachment permits changes in the length of oscillation to fit the character of work. Several minor engineering improvements have been made to simplify operation and lengthen the life of the machines.

✦ ✦ ✦

THE new polishers are two-purpose machines designed for automatic polishing, but quickly adaptable for finishing and sizing. These machines are the standard type used on Firthaloy dies throughout the country.

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THE gauge board with its plugs from .040″ up to .500″ by thousandths is equipped throughout with stainless steel gauges.

(*Please turn to page 487*)

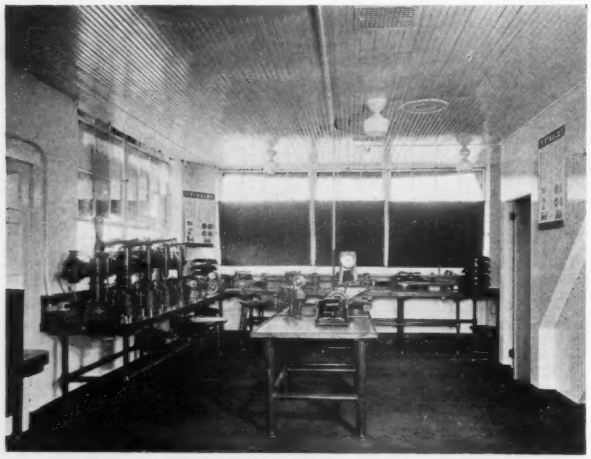

Fig. 1. Partial view of Hartford die plant for servicing Firthaloy dies.

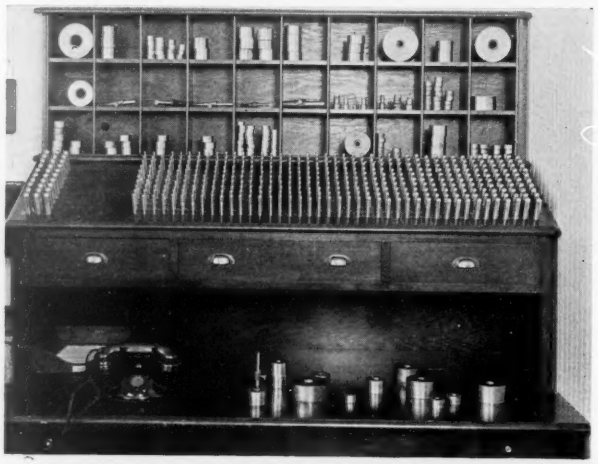

Fig. 2. Gauge Board.

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Selling In Egypt

By Walter Buchler, London, England

EGYPT is a market differing in many respects from those of Western countries. This is due to the Oriental mentality of the Egyptians and the cosmopolitan nature of the foreign communities trading in the country, particularly in such towns as Cairo, Alexandria, and Port Said, where most of Egypt's trade is transacted.

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THE general procedure in selling to this market is for manufacturers and exporters to appoint agents to act as their representatives for this territory. Success in this field depends almost entirely on who one's agents are, and it is of the utmost importance to ascertain the financial and moral standing of the agents they appoint, and when they appoint them, to exercise caution till they know exactly with what kind of person they are dealing. This end is to be achieved by keeping in close touch with the local Chamber of Commerce in the town in which the manufacturer of exporter is established, and through it or direct with the American Commercial attache in Cairo or the British Chamber of Commerce in Egypt.

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ALSO of great importance is it that representatives sent out to call on customers and make new connections should have a knowledge of French, which is spoken and understood by more business men in Egypt than is English. For when a representative is able to converse in French, he gains a better idea of the actual situation and the prospects this market holds out for what he has to offer than were he to depend solely on an interpreter to interpret what the prospective customer has to say.

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METHODS of trading in Egypt are more or less dictated by the supplier. The British supplier has been inclined to give too much credit in his anxiety to increase his export trade, and, in consequence people have received credit who really should not have. The most essential for sound business with Egypt is to have a reliable agent, and the most sound and reliable information to be obtained about a customer or prospect in that market is from your agent, always provided he is a sound man.

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OTHER countries, notably the Continent, are placing goods on consignment. In the long run, it is far better not to send on consignment; it is too risky. The usual terms are cash against documents with 2½ per cent. discount, or 60 or 90 days draft from date of shipment through a reliable bank. The bills are paid by the buyer in all cases where the agent is working on a commission basis, and perhaps no more than 10 per cent. of the agents in Egypt work on their own account. In former years, the agent dealt exclusively with the wholesaler in a host of lines, but owing to keen competition the situation at present is that agents supply retailers throughout the country usually on a credit time of sixty or ninety days. Providing the agent is reliable, there are very few losses.

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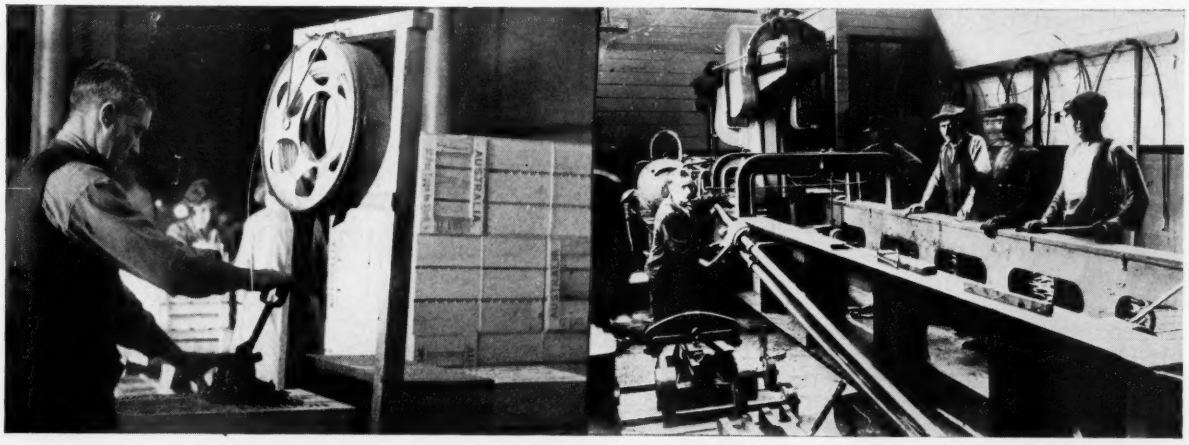
SALESMANSHIP in Egypt is not difficult, devolving on one point, namely goodwill of the trade. This goodwill is created by straightforward dealing and nothing else. Advertising in Egypt is as important as elsewhere, and the best form of advertising is the newspaper, but to obtain from advertising the maximum benefit it

(*Please turn to page 491*)



No. 6360 shows a man wiring down cases of eggs at the plant of the Farmers' Union Cooperative, Ltd., Adelaide, South Australia. Cases used to be nailed down, but this was found unsatisfactory, the quickest mode being to wire. This is done by a patent device as shown in the picture. Eggs are becoming an increasingly important export factor in Australia's trade, a good proportion going to Great Britain, where they enjoy preference over foreign markets. Wire-rope is produced in Australia, but considerable quantities are imported, as well as most of the raw material for wire products. ✦ ✦ ✦ ✦

No. 9525 showing wire-rope making at the British Ropes (Canada Factory), Ltd. Most of the wire used in Vancouver is imported from Great Britain and America. 60 per cent. of the rope made in Vancouver is used for logging purposes. There is also a considerable demand for mining purposes, such as haulage, hoisting, etc. All the machinery used in rope making here is imported, and the factory mentioned is thoroughly up-to-date. ✦ ✦ ✦ ✦ ✦ ✦

Outstanding Personalities of the Wire Industry

R. J. Wysor
Executive Vice President and General Manager, Republic Steel Corporation

MR. WYSOR, at 49 occupies one of the top positions in the steel world. In his new capacity he is directly in charge of every phase of the operation and the management of the country's third largest steel company, except finance.

✦ ✦ ✦

IN the 29 years since Mr. Wysor was graduated from the Virginia Polytechnic Institute, he has been almost continuously in the steel business and has worked for four of the five largest steel companies in the country. For about a year and a half, in the period 1910 to '11, he was a partner in a New York consulting laboratory and a metallurgist for the Panama Canal Commission.

✦ ✦ ✦

WYSOR started his business career as a chemist for the Carnegie Steel Corp. It was soon after he was made assistant chief chemist that he embarked on his own business ventue. In 1912 he became chief chemist for Bethlehem Steel Co.'s home plant at Bethlehem where he was responsible for the quality of all the materials that entered the plant. His next promotion was to the superintendency of the Bethlehem blast furnaces and from there to the position of superintendent in charge of the Service Division. In 1919 he was made assistant general manager of the Maryland plant at Sparrows Point. In 1923 when Bethlehem acquired the Cambria Steel Co., Johnstown, Pa., Wysor was made its assistant general manager which position he occupied for about two and a half years.

✦ ✦ ✦

HE then went with Jones and Laughlin as assistant general manager working with T. M. Girdler, chairman and president of the Republic Steel Corp., who was

R. J. Wysor, Executive Vice President and General Manager, Republic Steel Corp.

then general manager. Two years later when Girdler was elected president, Wysor succeeded him as general manager.

✦ ✦ ✦

C. M. White
Vice President Operations. Republic Steel Corporation

AT 44, **C. M. White** (Charlie to even his casual acquaintances), former lumberman, tanner, telephone lineman, railroad

C. M. White, Vice President in charge of Operations, Republic Steel Corp.

construction worker and steel worker, has been elected to one of the key positions in Republic Steel Corporation, vice president in charge of operations, succeeding **R. J. Wysor**, who was elected executive vice president and general manager.

✦ ✦ ✦

CHARLIE WHITE has been getting away with tough jobs ever since he was a kid. He was born in Oakland in the Alleghenies in western Maryland. He got his grammar school education in Hutton, Md., and graduated from Maryland State College with the degree of M.E.

✦ ✦ ✦

IN 1913 he took his first steel job as a machinist helper with the American Bridge Co. at Ambridge. Then he put two years as a millwright helper in a sintering plant. He ended up as the plant superintendent. This was the beginning of his association with the Jones & Laughlin Company.

✦ ✦ ✦

AT the end of two years he was made assistant blast furnace superintendent of the Eliza works and then master mechanic in charge of construction and power. He next went to the company's South Side Works as assistant to the general superintendent in charge of all mechanical and construction work.

✦ ✦ ✦

FOR a short time he left steel making and went into the railroad business as general superintendent of the Jones and Laughlin railroad.

✦ ✦ ✦

IN 1927 Mr. White was appointed assistant general superintendent of the Aliquippa Works and two years later was made general superintendent. In 1930 he went with Republic as assistant vice president in charge of operations and under his direction are some 90 per cent of Republic's 30,000 to 35,000 employees.

Outstanding Personalities of the Wire Industry

Walter H. Gardner, General Sales Manager, Keystone Steel & Wire Co., Peoria, Ill.

Gardner Appointed General Sales Manager at Keystone

WALTER H. GARDNER, Manager of Special Sales at Caterpillar Tractor Co., takes office as General Sales Manager of **Keystone Steel & Wire Company** on September 23rd.

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THIS appointment, according to Keystone executives, is in recognition of Gardner's outstanding work as an organizer and promoter in several fields.

✦ ✦ ✦

MR. GARDNER was formerly Sales Manager of the Yuba Mfg. Co. of San Francisco, doing a machinery business with farmers and miners. Later his advisory work with Ventura Refining Co. of California, and promotional aid to the Western Division of Taylor-Wharton Iron & Steel Company, led to his selection as General Advertising Manager of the Caterpillar Tractor Co. During his five years in this position he made a national contribution to industrial advertising by his use of action pictures. His experience in promotion and management, coupled with the flexibility of Keystone's active sales group, promises real action.

T. I. Phillips Works Manager Westinghouse Electric & Mfg. Co.

APPOINTMENT of T. I. Phillips as general works manager of the Westinghouse Electric & Manufacturing Company was announced by F. A. Merrick, president. In his new position Mr. Phillips will serve as central authority for all manufacturing operations of the company.

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MR. PHILLIPS has been with Westinghouse since 1915. In the years following his association he has held various positions of executive responsibility in factories of the company located at Chicopee Falls, Mass., and those of the Pittsburgh district. In 1930 he was appointed works manager of the Nuttall plant of the company. Three years later he was made works manager at East Pittsburgh and has held this position, with other duties assigned him, until this latest appointment.

✦ ✦ ✦

Hubert F. Hanks

HUBERT F. HANKS, manager of sales, steel and wire products, of the Pittsburgh Steel Company, died on August 23rd. He was with the Pittsburgh Steel Company since 1919, being manager of the fence sales department from 1920 to 1930.

R. L. HAMAKER

New York District Sales Manager for American Lime & Stone Company of Bellefonte, Pennsylvania. Born in Red Wing, Minnesota. Graduated from Kansas State College, Manhattan, Kansas 1906 with Degree in Mechanical Engineering. After three years in this work, entered the Lime Business and has been associated with lime producers continuously since that time. Member of the Wire Association Committee on Lubrication.

F. P. Schusler, Industrial Sales Division, Keystone Steel & Wire Co., Peoria, Ill.

✦ ✦ ✦

F. P. Schusler New Division Manager of Keystone Sales

PROMOTION of Ford Schusler, 712 East Corrington Avenue, to manager of the industrial sales division, is announced by Keystone Steel and Wire company.

✦ ✦ ✦

MR. SCHUSLER, a member of the staff handling large sales of wire and other materials to manufacturers, for the last seven years, took over the executive position with an optimistic view of future business. He declared the outlook is very bright.

✦ ✦ ✦

Nelson J. Darling

WITH the retirement of F. P. Cox as manager of the West Lynn, Mass., works of the General Electric Company on September 1, Nelson J. Darling, manager of the River Works of the company at Lynn, assumed management of both plants. ✦ ✦ ✦

MR. COX has been associated with the General Electric Company 45 years. Mr. Darling in his new duties will have N. M. DuChemin, formerly superintendent of the West Lynn works, as assistant manager in charge of operations at the River Works.

Exports and Imports of Wire

Exports of Iron and Steel Wire Products in July, 1935 and July, 1934.
(In gross tons)

	July 1935	June 1935	July 1934
Wire rods	2,824	2,368	576
Hoops, bands and strip steel	3,627	3,173	2,556
Plain black or galvanized iron or steel wire	2,553	4,364	3,241
Barbed wire and woven wire fencing	3,905	2,712	3,033
Woven wire screen cloth	100	119	83
Wire rope	329	414	248
Insulated iron or steel wire and cable—see analysis below			
Other wire and manufactures	620	335	444
Wire nails	1,277	644	809
Tacks	29	40	57
Other nails, including staples	343	160	291
Bolts, machine screws, nuts, rivets and washers	536	430	427
Total, these 11 classifications	16,143	14,759	11,765

Imports of Iron and Steel Wire Products Into the United States
(In gross tons)

Concrete reinforcement bars	721	300	336
Hollow bars and drill steel	102	66	131
Merchant steel bars	477	324	1,881
Wire rods	937	722	791
Barbed wire	1,390	2,344	1,098
Round iron and steel wire	224	488	315
Telephone and telegraph wire	3	4	.....
Flat wire and strip steel	65	97	132
Wire rope and strand	138	123	166
Other wire	187	40	131
Hoops and bands	1,290	2,517	1,868
Nails, tacks and staples	1,841	1,542	1,198
Bolts, nuts and rivets	28	56	1
Total, these 13 classifications	7,403	8,623	8,048

EXPORTS
INSULATED WIRE AND CABLE, MAY, 1935

	Foreign		To U. S. Possessions	
	Pounds	Dollars	Pounds	Dollars
Insulated iron or steel wire and cable	15,331	$ 3,705	2,014	$ 384
Rubber-covered wire	327,093	78,027	153,448	24,416
Copper weatherproof wire	106,428	12,671	22,071	4,152
Copper telephone cable	19,930	2,062	252	97
Other insulated copper wire	213,874	54,459	159,733	26,660
Nickel-chrome electric resistance wire	11,808	16,167	.....	.....
Total, these 6 classifications	694,464	$167.091	337,518	$55,709

Exports

INCREASING for the fourth consecutive month exports of iron and steel products from the United States rose to 296,802 gross tons in July, gaining 7,115 tons over the June trade and drawing ever closer to the 323,035-ton record level of last March.

✦ ✦ ✦

THIRTY-FOUR classes of iron and steel were exported in larger amounts in July than in June—the gains thus registered being more than adequate to offset the 30 instances of decreased trade including the 9,319-ton drop in shipments of iron and steel scrap. Included in this adverse side of the picture were the 2,205-ton drop in the trade in black steel sheets, that of 1,484 tons in the shipments of waste—waste tin plate, and that of 1,383 tons in the exports of galvanized wire. On the other hand there were such increases as those in skelp—9,970 tons, in tin plate—2,479 tons, in steel bars—2,348 tons, in seamless casing and oil line pipe—1,179 tons, in heavy rails, 1,132 tons, and in barbed wire—1,102 tons—and 28 more which, combined with those described in detail caused the volume of the trade as a whole to rise 7,115 tons.

✦ ✦ ✦

JAPAN was, as usual the month's principal market with purchases amounting to 118,442 tons including 109,982 tons of scrap iron and steel, 2907 tons of tin plate scrap, 2561 tons of steel bars, 1,041 tons of waste, waste tin plate, and 935 tons of wire rods. Out of Italy's total of 62,493 tons 62,169 tons was scrap. Canada's takings, on the other hand, were much more diverse and included 10,467 tons of skelp, 4,959 tons of scrap, 2,670 tons of black steel sheets, 1,749 tons of plain shapes, 1,316 tons of iron castings, and 1,028 tons of steel bars. Like Italy Rumania leaned heavily toward scrap, her total of 9,991 tons being scrap with the exception of 30 tons. Mexico purchased modest quantities of many kinds of wares, including in her 7,463-ton total 1,727 tons of scrap and 1,422 tons of black steel sheets. Chile — 5,953 tons in all—was the month's best purchaser of heavy rails—4,592 tons, while the highly diversified trade with the Philippine Islands—totaling 5,153 tons—included 1,838 tons of galvanized steel sheets.

✦ ✦ ✦

Imports

FOLLOWING the June trend, the 31,894-ton import trade in iron and steel products during July dropped 3.9 percent from the total for the previous month, but held at a volume 88 percent more than receipts during the corresponding month of 1934. The gains and losses in individual classifications were more or less evenly balanced with 17 decreases and 15 gains, while in 5 classifications no trade occurred during either month. The sharpest decline was recorded in 'other pipe', 1,397 tons, followed by structural shapes, 1,272 tons, 'other hoops and bands', 1,227 tons, pig iron 1,064 tons, barbed wire, 954 tons, and scrap, 833 tons. Cotton ties registered the most pronounced gain, 2,211 tons, while other increases of moment took place in receipts of ferromanganese and spiegeleisen, 1,809 tons, rails and rail fastenings, 634 tons, bars, whether hollow or solid, 589 tons, and concrete reinforcement bars, 421 tons.

✦ ✦ ✦

BELGIUM moved into first position as supplier of iron and steel products to the United States with an aggregate of 8,015 tons made up chiefly of structural shapes, 2,700 tons, bars, whether solid or hollow, 1,244 tons, 'other hoops and bands', 727 tons, nails,

(*Please turn to page 492*)

A Review of Recent Wire Patents

No. 2,010,152, INSULATED CONDUCTOR AND METHOD OF COATING THE SAME, Patented August 6, 1935 by Anthony P. Hinsky, Brooklyn, N. Y., assignor, by mesne assignments, to Pyro Products Corporation, Brooklyn, N. Y., a corporation of New York.

The method consists essentially in passing the wires through a suitable reservoir containing a dark colored dielectric saturant which reservoir also has a pigment of light color precipitated to the bottom thereof, the wire conductor passing first through the saturant and then through the pigment, the pigment providing a lighter colored coating for the conductor.

✦ ✦ ✦

No. 2,010,676, SPRING, Patented August 6, 1935 by Harry L. Lieberman, Chicago, Ill.

More specifically this covers an upholstering spring, the ends of the helical being readily attached to the upright spiral springs. It is claimed the construction will prevent relative horizontal movement between the helicals and spirals.

✦ ✦ ✦

No. 2,010,941, GALVINIZING APPARATUS, Patented August 13, 1935 by Albert F. Bradley, Sterling, Ill., assignor to Northwestern Barb Wire Company, Sterling, Ill., a corporation of Illinois.

It is stated that this apparatus will galvanize wire, free of oxide of zinc or other undesirable coating material and the coating will be of an even thickness.

✦ ✦ ✦

No. 2,010,946, GALVANIZING APPARATUS AND METHOD, Patented August 13, 1935, by Paul W. Dillon, Sterling, Ill., assignor to Northwestern Barb Wire Company, Sterling, Ill., a corporation of Illinois.

This apparatus is especially adapted for galvanizing wire fencing, the fencing being galvanized after it is woven. It is stated that the formation of globules upon the galvanized fabric will not take place.

✦ ✦ ✦

No. 2,010,964, WOVEN WIRE FABRIC, Patented August 13, 1935 by Charles A. Scheeler, Buffalo, N. Y., assignor to Buffalo Wire Works Co., Inc., Buffalo, N. Y., a corporation of New York.

A wire screen, particularly for bank protection, is provided, the screen comprising helical transverse wires closely interwoven with the longitudinal wires.

✦ ✦ ✦

No. 2,010,986, SPRING CONSTRUCTION, Patented August 13, 1935 by Otto L. Goethel, Grand Rapids, Michigan.

A spring unit is provided which may be joined to other units to form a finished article, such as a mattress, the springs being either of the cylindrical or hour glass type.

✦ ✦ ✦

No. 2,011,213, ENAMEL LACQUERED WIRE AND LACQUER FOR MAKING SAME, Patented August 13, 1935 by Alfred Ehrenzweig, Wurenlos/Aragau, Switzerland.

Complete Descriptions and Drawings of Patents May Be Had for 25 cents. Address, Wire & Wire Products, 17 East 42nd St., New York.

This lacquer, specifically adapted for enameling wire, comprises as its essential components a hardenable phenol-formaldehyde resin and tricresyl phosphate, dissolved in triacetin.

✦ ✦ ✦

No. 2,011,324, METHOD OF MANUFACTURE OF REVOLVING WIRE, FIBER, OR BRISTLE BRUSHES, Patented August 13, 1935 by Frederick Parker Rigby, Sheffield, England.

More specifically, the method comprises securing the wire or other material to the brush body, bendable pins being provided in spaced parallel relation, with a wire gauze above the pins. The bristles are then placed on the gauze with a core upon the bristles, the bristles and core being forced into a channel shape, which forcing simultaneously bends the pins in the wire gauze to secure the bristles.

✦ ✦ ✦

No. 2,011,398, METHOD AND APPARATUS FOR DRAWING AND COATING WIRE, Patented August 13, 1935 by Blees C. Dimmick, Peoria, Ill., assignor to Keystone Steel & Wire Company, Peoria, Ill., a corporation of Illinois.

Iron or steel wire may be immediately coated after drawing, according to this patent, the depth of the coating being regulated by the time of submergence of the hot wire in the flux.

✦ ✦ ✦

No. 2,011,463, PIPE MANUFACTURING MACHINE, Patented August 13, 1935 by Guido Vianini, Rome, Italy.

This machine is adapted for wire reinforcing concrete and similar pipes, the tension of the wire being regulated as required.

✦ ✦ ✦

No. 2,011,561, CABLE, Patented August 20, 1935 by Philip H. Chase, Bala-Cynwyd, Pa.

A high voltage, impregnated, electric cable is provided comprising a wire conductor with a sheath thereabout and a hollow expansible impermeable conduit within the sheath, the conduit being formed in separate sections, each section communicating with the atmosphere.

✦ ✦ ✦

No. 2,011,761, SCREW THREAD ROLLING APPARATUS, Patented August 20, 1935 by Charles E. Handel, Winterset, Iowa, assignor to Munson Manufacturing Company, Winterset, Iowa, a corporation of Iowa.

Rolling is accomplished by a series of cylindrical rollers equally spaced about the stock, when the rollers are rotated relative to the stock, they will progressively depress small segmental portions of the stock and form screw thread grooves, the metal between the depressions being forced upwardly and forming screw threads.

No. 2,011,956, METHOD OF GRINDING WORMS AND SCREWS, Patented August 20, 1935 by Nikola Trbojevich, Detroit, Mich.

The conventional disc wheel is selectively oscillated in its plane tangentially and transversely of the stock according to this method.

✦ ✦ ✦

No. 2,012,026, WIRE ROPE MAKING MACHINE AND METHOD, Patented August 20, 1935 by Charles C. Sunderland, New Brunswick, N. J., assignor to John A. Roebling's Sons Company, Trenton, N. J., a corporation of New Jersey.

One of the objects of the invention is to provide positive control of the wire strands in respect to tension. The machine is of that type where the wire supply spools are arranged in line axially of the machine, as common in "snake rope" machines.

✦ ✦ ✦

No. 2,012,074, ENTRY GUIDE, Patented August 20, 1935 by Sheridan Augustin Smith, Hamilton, Ontario, Canada.

An entry guide box is provided adapted to receive a rod or the like of substantially oval cross section, the construction including a number of rollers to support the rod, the faces of the rollers being each formed with a peripheral groove having substantially straight diverging side walls, the walls providing a two-point suspension for the rods, the points of suspension being located inside the outer edges of these walls.

✦ ✦ ✦

No. 2,012,126, SUBMARINE SIGNALING CABLE, Patented August 20, 1935 by John J. Gilbert, Douglaston, N. Y., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York.

This cable is of the twin-core type. It is stated the cable will not rotate while being laid nor will the armor wires straighten out.

✦ ✦ ✦

No. 2,012,176, APPARATUS FOR PRODUCING WIRE, Patented August 20, 1935 by Olof N. Tevander, Chicago, Ill., assignor to Standard Cap & Seal Corporation, Chicago, Ill., a corporation of Virginia.

More specifically, the invention lies in an apparatus for coating wire, the wire passing through a conduit having walls engaging the wire and changing the angular direction of travel of the wire, one mouth of the conduit being above the molten coating material and the other mouth below.

✦ ✦ ✦

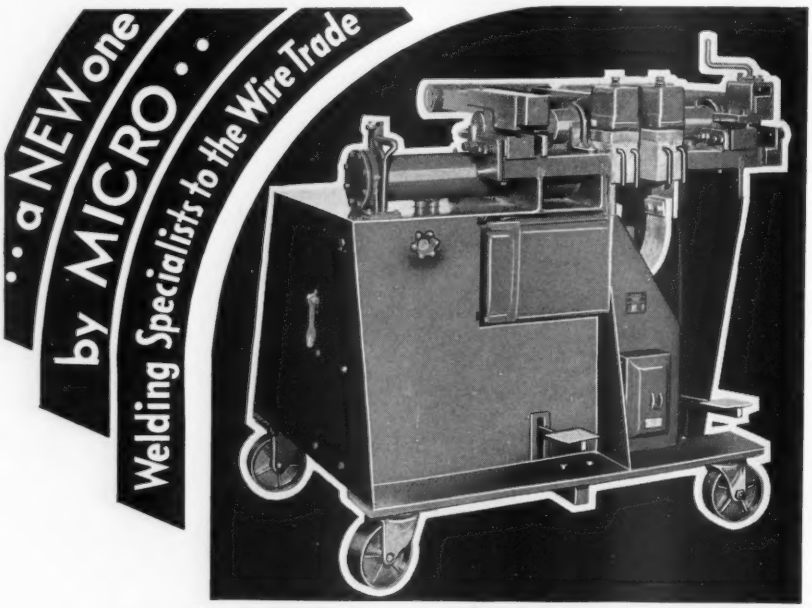
No. 2,012,575, AUXILIARY CONSTRUCTION FOR SEATS, MATTRESSES AND THE LIKE, Patented August 27, 1935 by James L. McInery, Grand Rapids, Michigan.

The construction comprises a number of paralleling wire members disposed at the upper ends of the helicals to prevent the padding being forced into the openings in the spring and between them.

'Round the World With the Wire Industry

Agreement Reached Between British Federation and International Steel Cartel

A COMPREHENSIVE agreement to come into force December 8, has been reached between the *British* Federation and International Steel Cartel, according to the London press. Prior to December 8, the provisional agreement will remain in effect which will enable the British group to establish in London an office to control imports. It is agreed that for the year beginning August 8, the total steel imports to Great Britain from the Continent shall be fixed at 670,000 tons, on condition that the total in the subsequent year is reduced to 525,000 tons. Sales to Great Britain was to have begun during the week of July 26, on the basis of former prices, the duty of 33⅓ percent still to be paid. It is pointed out that one of the advantages of the agreement is the scope it provides for extension in the United Kingdom and further the maintenance of the 1934 standard of British exports will assure for them a secure position in world markets. One of the reasons why it has been decided to extend the temporary agreement rather than attempt to put the permanent agreement into effect from the August date is to give the British industry time for setting up a more adequate organization, both for the control of imports and for the centralization of exports.



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✦ ✦ ✦

Change in British Duty

EFFECTIVE August 15, the *British* duty has been reduced to 20 percent until January 7, on barbed wire, single strand wire, upholstery wire and springs, nails including hob nails, staples not insulated, tacks, boot, shoe studs and spikes, galvanized hexagonal wire netting, plates and sheets all kinds not exceeding 16 pounds per ton, rods in coils not exceeding 9 pounds per ton, excepting certain type wrought iron, in accordance with an agreement entered into with the Continental Steel Cartel.

✦ ✦ ✦

EFFECTIVE August 3, duties on iron and steel tubes and pipes, other than cast, when valued under £13 per ton increased to £5 when valued at £13 to £15 and the duty equals the difference between the value and £18 when the value exceeds £18, the duty remains at 20 percent. The reason ascribed for the change is the prospective intensive competition following the collapse of the international tube cartel. Sweden has agreed to the necessary alteration of the Anglo-Swedish Trade agreement.

✦ ✦ ✦

German Manufacturers of Bolts, Rivets, Nails, and Screws, Report Satisfactory Development

SATISFACTORY development in general is reported by the

'Round the World With the Wire Industry

German industry manufacturing bolts, rivets, nails, screws, and other fasteners with domestic sales and exports showing a substantial increase along most lines. Rivet production and sales have been the more outstanding, having commenced an upward trend during 1934 and continuing throughout the first half of this year. The trade in bolts, screws, nails, and other fasteners has been spotty but exports in general have shown an encouraging rise; however, domestic business, while slightly improved, has remained sluggish. During the first 5 months of this year sales of wire nails to the United States have shown a substantial gain.

✦ ✦ ✦

GERMANY'S foreign trade in wire and wire products shows a very satisfactory improvement in 1935. It is of interest to note exports have been greatly increased to the United States and further to all such markets with which Germany is doing barter business. The German wire industry has regained the position which was lost in 1934 and in 1933. A large amount of barter business is being transacted with the United States, particularly with California.

✦ ✦ ✦

THE figures in tons for the first half of 1935, as compared with the first half of 1934, are as follows: Wire rods 26,135 (21,116-1934), Finland, Bulgaria, Greece and Esthonia together took 68% of total exports compared with only 17% last year. All of these four markets trade by barter with Germany. Imports declined from 52,961 tons to 17,557 tons because the Saar is not foreign supplier since March. Exports of bright wires chiefly for manufacturing purposes, are 34,918 tons (29,652 tons-1934). Here also the barter customers were in the first place, Brazil, Turkey, Holland and Chile being the leading customers, taking 49% of total exports. Galvanized, tinned, coppered and other wire, 33,046 (32,553 tons-1934). Norway, Brazil, Holland, Argentine together took 52% of German exports of wire nails and staples, 14,772 tons (10,628 tons-1934). The United States increased her purchases of German wire nails from 3,728 to 7,189 tons, and more than 50% of this quantity had been trade by barter. Exports of wire rope and strand rose from 4,384 tons to 5,830 tons and this figure is the best in seven years. British India took 1,041 tons, four times more than in 1934; the United States 527 tons (516 tons-1934) and the South American States have also taken more. Exports of barbed wire amounted to 29,364 tons (12,127 tons-1934) and here the U. S. was the best customer with 11,715 tons (4,202 tons-1934). The remaining exports the

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DESIGNERS OF "THE MACHINES THAT PUT THE 'RINGS' IN SPRINGS"

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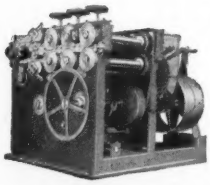
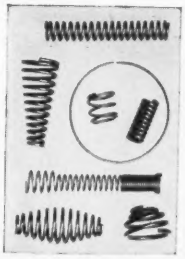


UNIVERSAL SPRING COILING MACHINES are built in fourteen sizes, handling cold, oil-tempered wire from .004" to ⅝" diameter. Produce an extraordinary variety of spring forms (a few of which are seen at the right) at high speeds. The machines are offered in two types, both of which automatically close and square the end coils as desired. Bulletin Nos. 101 and 101-A give full details.



In addition to many other standard spring and wire coiling machines, spring-hooking, and spring-setting machines we offer:—
Book Spiral Coiling Machines. Bearing Spiral Machines.
Flat Ring Coiling and Edgewise Coiling Machines.
Torsion Spring Machines. Lockwasher Machinery.
Flexible Casing and Flexible Metallic Tubing Machines.
Rolling and Flattening Mills and Take-Ups.
Wire Nail Machines. Wire Reels.
Wire Drawing and Wire Spooling Machinery. Wire Mill Equipment.

'Round the World With the Wire Industry

barter trading countries were dividing among themselves with considerable quantities. Exports of wire netting and wire mesh amounted to 6,320 tons (5,090 tons-1934), with British South Africa, Holland, Norway and India as the best customers. Exports of small wire products such as pins, hooks, wire brushes, springs, etc., rose to 2,822 tons (2,487 tons-1934) of which more than 75% was exported to barter trading countries. The outlook for the further development of German exports is satisfactory.

+ + +

IWECO Wire Netting Agreement

FOLLOWING the agreement between the IWECO and the British wire netting manufacturers association concerning distribution of a number of foreign markets, the outlook for a general agreement with the British wire industry is much improved. However the British wire industry is not united in the same way as the continental and there is nobody to deal for the whole British industry.

+ + +

AFTER prolonged negotiations the German wire netting cartels have been extended now for the period of another year.

+ + +

Wood Screw Negotiation Cancelled

NEGOTIATIONS between the continental wood screw makers and the British, Swedish and Italian industry have been cancelled. The Italian competition is less felt for the moment, because this industry is busy working for the Government's war demand. The Swedish competition is very keen, but the export movement is satisfactory.

PROCEEDINGS AND DISCUSSIONS OF THE 1935 Wire Association Meetings

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Waterbury, Connecticut

OFFICES

CLEVELAND CHICAGO PHILADELPHIA

Firthaloy Introduces the "Diagraph"

(*Continued from page 478*)

FIRTHALOY dies will be carried in stock in the form of rough mounted nibs to be cut to any desired size. Adequate stock will be carried to supply the New England trade. The Company plans to install additional machinery as required, the first of which will be a ten head driller for small sizes.

✦ ✦ ✦

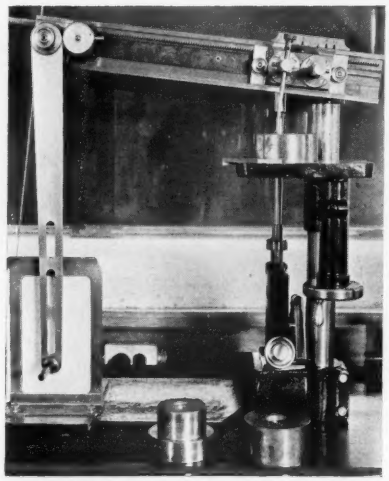

Fig. 3. Diagraph—instantly records the exact contour of any die. ✦ ✦ ✦ ✦

A BUFFET luncheon was served visitors in the Company's warehouse and the affair, like the one in connection with the opening of their Chicago die plant some months ago, brought together over one hundred New England wire makers who seldom meet except at Wire Association annual meetings.

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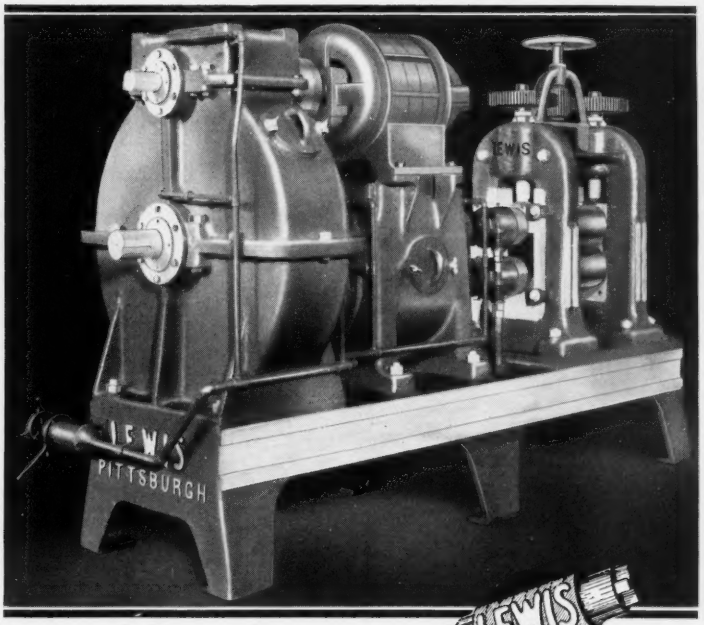

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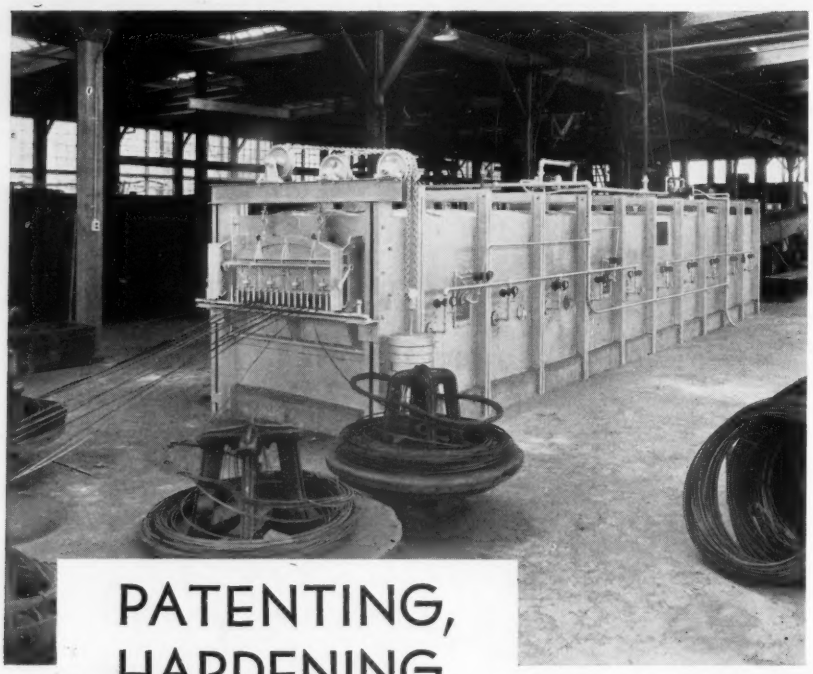

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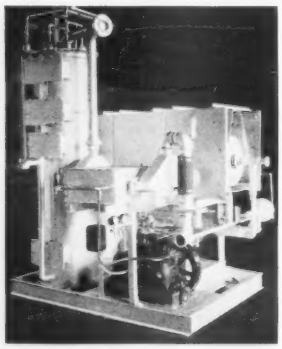

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Special Steels in Wire Form

(*Continued from page 472*)

cold working point of view these alloys are fairly easy to work, responding to forces generated without the characteristic stubborn resistance noticeable in majority of alloy steels.

✦ ✦ ✦

ALTHOUGH of a fairly plastic nature the fabrication of these alloys in wire rod form by hot rolling is a difficult proposition, as in the heated condition they are extremely mild and damage easily from surface inclusions such as scale, etc., which form indentations in the surface structure. Defects due to segregation are also common, and where deep-seated often entail a high waste of metal in the endeavour to eliminate by grinding.

✦ ✦ ✦

Cold Working

WHERE reduced in bar form by cold working the practice varies in different establishments, but the method of first subjecting to a preliminary grinding pass before proceeding with the drawing operation is undoubtedly the best, as any pits or flaws existing are plainly revealed by the removal of the skin. This also ensures the complete removal of all scale and foreign matter, not always efficiently performed by the acid cleaning operation, for with the strong adherence of scale to the base metal with these alloys, minute particles of scale are often carried over and later, being drawn into the metal, are revealed as small indentations in the surface.

✦ ✦ ✦

WITH drawing as the first operation there is liability to draw or impress surface imperfections further into the base, with a consequent risk of these being incorporated in the finished material. Practically all nickel iron alloys cold worked in bar form are finished by precision grinding, a reduction of from one to four thousandths being the average per pass.

✦ ✦ ✦

GRINDING however entails loss by waste, and where continuance is essential to remove deep-seated imperfections often means

the difference between loss and profit. No more economical method however is known for the elimination of these faults, and where so deep seated as to extend beyond the diameter of the finished material, the only prospect is to scrap the material or place it in stock for subsequent reduction to a finer size.

✦ ✦ ✦

Applications of Nickel-Iron Alloys

THOUGH new and further uses for nickel-iron alloys are announced almost daily, perhaps the most remarkable application is that of temperature control. While a detailed description of thermostats and components is not the purpose of this article, it may be stated briefly that 36% nickel-iron alloy has a practically negligible co-efficient of thermal expansion within the range of normal—200 degrees C. Therefore in conjunction with an high-expansion alloy it is ideal as one of the essential elements necessary to form temperature-sensitive components for the thermostat.

✦ ✦ ✦

THE foregoing is cited as an illustration of one of the many outstanding features pertinent to this particular type of alloy which, in the opinion of many in close touch with the commercial side of the industry will in the near future have a demand exceeding for years all present known sources of supply.

✦ ✦ ✦

Drawbacks to High Production By Cold Drawing

ONE of the drawbacks to high production by cold work, as wire, etc., is the light weights produced in coil form, due to the difficulty of maintaining heat during the hot rolling process. Various theories are expressed as to the cause, but little doubt exists that the great pressure necessarily imposed during rolling tends to a rapid release of heat and a consequent malformation of structure when subjected to stress at a temperature below that essential to efficient reduction. With present speeds and heavy weights there is a tendency for too rapid cooling off in the latter half of the coil before

(*Please turn to page 490*)

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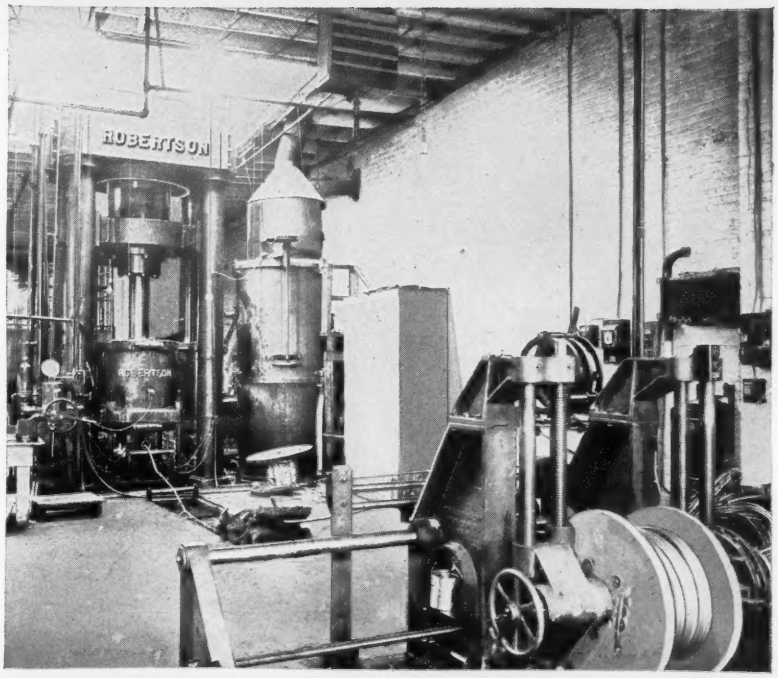

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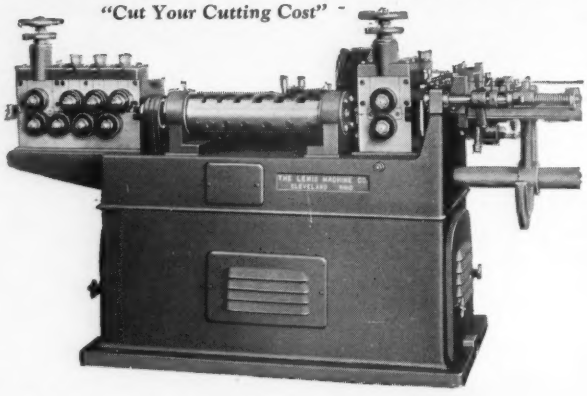
Robertson also makes all the allied equipment for the operation of the presses. Data on any of the following will be sent on request: Hydraulic Pumps, Melting Furnaces and Pots, Dies and Cores, also Lead Sheath Stripping Machines, Hydro-pneumatic Accumulators and Extrusion Presses.

John ROBERTSON CO. INC. Pioneers~Since 1858

125-37 Water Street Brooklyn, N. Y.

REPLACE OBSOLETE EQUIPMENT

"Cut Your Cutting Cost"



ACCURATE STRAIGHTENING
UNIFORM LENGTHS, HIGH PRODUCTION
ARE ALL AVAILABLE ON
MODERN LEWIS WIRE STRAIGHTENING AND CUTTING MACHINES.
BUILT FOR STEEL MILL PRODUCTION REQUIREMENTS

THE LEWIS MACHINE COMPANY
1603 E. 24th St. Cleveland, Ohio

QUALITY
DIAMOND DIES
Since 1870

Balloffet Diamond Wire Dies Co., Inc.

13-15 East 22nd Street

New York

Special Steels in Wire Form

(*Continued from page 489*)

completion of the rolling process, with a resultant crushed structure in this portion of the ring.

✦ ✦ ✦

IN coil form the maximum weight of nickel-iron alloys is approximately 40, and the average, 15 to 30 lbs. The resultant high percentage of waste and scrap due to these light weights has a considerable influence on the selling price of the finished material.

✦ ✦ ✦

Market Outlook For Nickel-Iron Alloys

THOUGH chromium and kindred stainless steels rank first in present demand, the steady application of nickel-iron alloys to various new fields and processes indicates that the nickel series of metals are quickly regaining that first place which they formerly held in the early days of special steels, and though ranking high at present in special steel qualities are destined in the future to rank still higher.

EFFICIENT PICKLING
Assured With
RODINE
Rodine saves acid and metal, prevents acid brittleness, and reduces acid fumes.
Samples and complete information sent on request.
AMERICAN CHEMICAL PAINT CO.
Ambler, Pa.
Detroit Office and Warehouse
6339 Palmer Ave.; E.

NEP
100% INHIBITOR
The Only Inhibitor Not Diluted
Adopted by 30 Companies
The Wm. M. Parkin Co.
Chemical Engineers
Pittsburgh, Pa.
Actively in Steel since 1860

Selling in Egypt

(*Continued from page 479*)

is paramount that the manufacturer or exporter be properly represented. Perhaps the best advertisement of all is to supply merchandise of good quality, thus winning the recommendation of the public. Samples do not play the same important part in Egypt as they do here. Yet they are essential, as were the trade not sampled, it would never know the latest products of the manufacturer.

✦ ✦ ✦

New St. Louis Metal Warehouse

STEEL SALES CORPORATION, who for many years have maintained a sales office in St. Louis have recently opened a warehouse located at 4067 Park Avenue.

✦ ✦ ✦

THE service to the manufacturer is somewhat broader than is indicated by the name of this concern, which has grown from a distributor of Steel to that of numerous Non-Ferrous metals, including Brass, Copper, Nickel Silver, Phosphor Bronze, Monel Metal, Pure Nickel and Zinc.

✦ ✦ ✦

COMPLETE facilities have been installed to supply these materials cut and sheared to customers specific requirements.

✦ ✦ ✦

Herbert J. Watt

HERBERT J. WATT will be district sales manager at New York of the Jones & Laughlin Steel Corporation. He succeeds the late Robert M. Kilgore who was district sales manager at New York since 1921.

✦ ✦ ✦

MR. WATT was appointed manager of sales of railway materials for Jones & Laughlin in 1928. He had been with the company since December 1, 1925.

PROCEEDINGS AND DISCUSSIONS of the 1935 WIRE ASSOCIATION MEETINGS
Price $5.00 Per Copy

KEYSTONE
Stop Guessing About Wire !
Nationally known converters who depend on KEYSTONE for all their wire needs will tell you there's no guesswork about the quality and uniformity of KEYSTONE wire.
So whether your requirements are for galvanized, tinned, coppered, liquor finish, or annealed (low, medium, high carbon) your wire will always come from KEYSTONE just the way you like it. When it's backed by KEYSTONE'S skill, experience, equipment, accurate testing and careful inspection, you know it's O K!
OK for uniformity ..quality

Manufacturers of wire for every purpose from paper clips to telephone lines.

KEYSTONE STEEL & WIRE CO.
Peoria, Ill.

— DESCO —

A PICKLING STABILIZER ▲ ▲ ▲
FOR CARBON STEELS ▲ ▲ ▲

▲ ▲ ▲

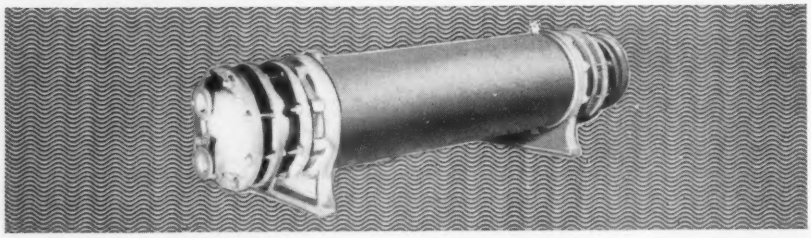
The strong passivating effect of this excellent inhibitor insures a bright finish and forms a sound basis for a bright drawing technique—

▲ ▲ ▲

DELANY CHEMICAL CO.

COTTMAN AND MILNOR STS.,
PHILADELPHIA, PA.

An *Acid-Resisting* HEAT EXCHANGER



The acid heating unit or heat exchanger shown above is a new development for the heating or cooling of corrosive solutions. All parts subject to corrosion are made of corrosion-resisting materials.

Depending upon the solution to be heated or cooled, and the temperature desired, the unit will satisfactorily handle from 10 to 50 g.p.m. For greater capacities sufficient units can be manifolded for either series or parallel flow.

When used as a heating or cooling unit, the outer jacket is made of ordinary steel, but when used strictly as a heat exchanger and a hot or cold corrosive liquor or gas is used as a heating or cooling medium, the outer jacket is made of corrosion resisting materials.

This heat exchanger or acid heating unit is produced in **D**uriron, **D**urichlor, **D**urimet and **D**urco corrosion-resisting Alloy Steels.

SPECIFICATIONS

Overall dimensions	12¾" O.D. x 5'6" long
Liquid inlet connection	2" split flange
Liquid outlet connection	2" split flange
Steam inlet connection	1" or 1½" threaded
Steam outlet connection	1" or 1½" threaded
Heating surface	14 sq. ft.
Steam pressure recommended, 75 lbs. maximum	

THE DURIRON COMPANY, Inc.

445 N. FINDLAY ST. DAYTON, OHIO

For Nearly Fifty Years Our Products Have Been Standard
for
The Wire Industry
"Regular" — "English" — "B" Brands
Wire Drawing Powders
Samples and prices sent upon request.
The J. T. Robertson Co., Inc.
143-151 Richmond Ave. **SYRACUSE, N. Y.**

***Learn about* PARALAN**

Paralan will give your finished wire and wire products protection from atmospheric corrosion in the mill and in shipping. Paralan-coated wire can be spot welded or soldered without cleaning. Also, Paralan leaves surfaces in good condition for all types of finishes—enameling, japanning, lacquering, plating, etc.

Write for further information. We may be able to solve your difficulties.

AMERICAN LANOLIN CORP.
LAWRENCE, MASSACHUSETTS

Exports and Imports of Wire

(*Continued from page 482*)

tacks, and staples, 714 tons, and cotton ties, 669 tons. Germany's widespread trade accounted for 7,660 tons, the chief items moving in this tonnage being cotton ties, 1,542 tons, 'other pipe', 1,536 tons, barbed wire, 1,172 tons, nails, tacks, and staples, 1,095 tons, and bars, whether solid or hollow, 446 tons. Canada, the third source, accounted for 6,630 tons of which the chief items were ferromanganese and spiegeleisen, 4,552 tons, scrap, 847 tons, rails and rail fastenings, 591 tons, and pig iron 413 tons. British India's participation of 3,257 tons was confined solely to pig iron, while the next source of supply was Sweden with a total of 1,727 tons made up principally of wire rods, 595 tons, merchant and other steel bars, 440 tons, 'other pipe', 241 tons, round iron and steel wire, 113 tons, and hollow bar and drill steel, 102 tons. The chief items moving in the United Kingdom trade totaling 1,572 tons were pig iron, 1,147 tons, and ferromanganese and spiegeleisen, 200 tons.

✦ ✦ ✦

CARD clothing receipts followed an upward trend amounting to 17,818 square feet valued at $23,848 to gain 6,136 square feet and $7,149 over the June take, and the United Kingdom was the sole participator.

✦ ✦ ✦

THE trade in wire cloth and screening also gained, the 66,669 square feet imported increasing 7,752 square feet, the chief sources of supply including France, 43,062 square feet, Canada, 12,051 square feet, and the Netherlands, 6,019 square feet.

✦ ✦ ✦

A SHARP gain of 16,590 square feet was registered in the **fourdrinier and other paper making wire** trade aggregating 42,349 square feet supplied entirely by Germany, 23,633 square feet, and Austria, 18,716 square feet.

✦ ✦ ✦

THE trade in **wire heddles** aggregating 1,257,000 pieces recorded a decline of 360,000 pieces

from June receipts and came from Switzerland, 607,000 pieces, France, 500,000 pieces, and Germany 150,000 pieces.

✦ ✦ ✦

IMPORTS of **wire fencing and netting,** galvanized before weaving, continued to drop, the July total of 214,400 square feet decreasing 180,305 square feet, and coming entirely from Belgium. Of the galvanized after weaving grade, the receipts of 661,500 square feet—all from the Netherlands—recorded a sharp decrease of 264,490 square feet.

✦ ✦ ✦

EXPORTS of iron and steel wood screws during July, 1935, totaled 35,291 gross valued at $3,054. Of this total Cuba took 19,082 gross valued at $1,299; Union of South Africa 4,575 gross valued at $352; Dominican Republic 4,392 gross valued at $412; Mexico 1,430 gross valued at $151; Canada 1,311 gross valued at $237; Colombia 1,200 gross valued at $109; Venezuela 1,096 gross valued at $200.

✦ ✦ ✦

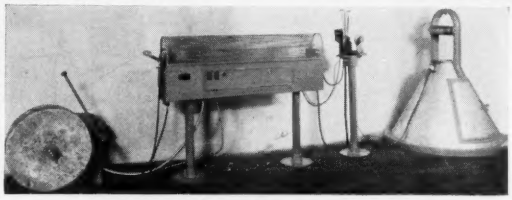
EXPORTS of brass wood screws during the same period totaled 5,539 gross valued at $1,795. Of this amount Cuba took 1,432 gross valued at $628; Chile 1,152 gross valued at $245; Panama 944 gross valued at $325; Philippine Islands 761 gross valued at $164; Peru 387 gross valued at $110; Mexico 350 gross valued at $105.

✦ ✦ ✦

IMPORTS of wood screws during the same period amounted to 30,360 gross valued at $2,607 of which Sweden supplied 24,155 gross valued at $1,929; Japan 3,700 gross valued at $434; and Germany 1,905 gross valued at $169.

✦ ✦ ✦

WILBUR B. DRIVER COMPANY, Newark, New Jersey, manufacturers of Tophet, Cupron and other resistance alloys announces that **Mr. Erich Fetz** has joined its metallurgical staff as research metallurgist. Mr. Fetz has had extended metallurgical experience in this country and abroad.



Automatic depanning, wire measuring, spark testing and reeling outfit—combines many operations — saves time and labor cost.

(Patent applied for)

This machine will
1—Depan rubber covered wire after vulcanization,
2—Stop automatically if wire tangles when leaving pan,
3—Measure total length of wire and, if desired, stop on reaching any predetermined length as measured by an auxiliary dial,
4—Check diameter of covered wire for over or under size insulation, stopping automatically in either case,
5—Spark test rubber insulation for faults,
6—Wind the wire on a reel on a motor driven reel stand.

EST. 1865 AIMCO INC. 1913
"American" AIM INSULATING MACHINERY COMPANY
REG. U.S. PAT. OFF.
517 West Huntingdon St.
PHILADELPHIA PENNSYLVANIA U.S.A.

Wire Bunching Machines

NEW TYPE — HIGH SPEED
SELF CONTAINED — EASILY MOVED

Will produce 4,500 to 36,000 feet of bunched wire per hour.
Reel capacity 350 lbs.

Write for complete information today.

New England Butt Company

DEPT. W-10 PROVIDENCE, R. I.
CHICAGO OFFICE — 20 NORTH WACKER DRIVE

SCHUMAG

Rod Making Machines
Rod Straightening & Polishing Machines
Wrapping Machines for coils, bundles, etc.
Packaging-Weighing Machine for nails, screws, etc.

Agents for U. S. and Canada:

W. A. SCHUYLER

Fisk Bldg. New York, N. Y.

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Before disclosing your inventions to anyone send for blank form "Evidence of Conception" and instructions "How to Establish Your Rights".

All cases submitted given personal attention by members of the firm. Information and booklet free.

Lancaster, Allwine & Rommel

PATENT LAW OFFICES

Suite 438, Bowen Building 815-15th St., N.W. Washington, D. C.

Wire Drawing Diamond Dies

COCHAUD
WIRE DIE CORPORATION
300 W. 56th ST., NEW YORK
Tel. Col. 5-1340

BISCO
TUNGSTEN CARBIDE DIES
For Wire, Rod and Tubing
Round and Special Shapes
TUNGSTEN ELECTRIC CORP.
BISSETT STEEL DIVISION
Cleveland
Cincinnati Chicago Philadelphia

VIANNEY
The lowest priced Diamond Die in the world based on actual drawing performances.
DIES for GOLD, SILVER WIRE

TUNGSTEN, DIAMOND, TANTALUM
DIES
KELLY
WIRE DIE CORPORATION
256 W. 31st St. New York

WIRE MILL EQUIPMENT
MORGAN CONSTRUCTION CO.
WORCESTER, MASS.

New Products Development Corp.
Consulting and Research Engineers
Specializing in developing new wire products, manufacture of wire, insulated wire and high tension cable.
Standard and special equipments developed, built and installed. Any problem you may have, we solve it if you consult us.
Phone: Yonkers 3727
20 So. Broadway, Yonkers, N. Y.

Kenneth B. Lewis
CONSULTING ENGINEER
Wire Mill Equipment, Layout and Practice
17 East 42nd St. New York City
43 Midland St. Worcester, Mass.
Phone: Murray Hill 2-4188
Phone 5-6033

Republic Issues New Attractive Tack Catalog

AN attractive, new 40-page catalogue on Republic Wire Nails has just been issued by Republic Steel Corp., McCormick Bldg., Chicago, Ill. The catalogue gives a large fund of information on Republic Wire and Wire Products, including nails and staples. Republic Steel Fence Posts and Assemblies are also listed and described in the new book.

✦ ✦ ✦

THE novel design and color combination of the book, together with the useful information which it contains, make the new catalogue a valuable handbook which will find a permanent place on desks of wire and wire products users and buyers. Copies may be obtained from Republic Steel Corp., McCormick Bldg., Chicago, Ill., or from any of Republic's 26 district sales offices located in key cities throughout the country.

✦ ✦ ✦

Ludlum Steel Co. to Erect Addition to Dunkirk Plant

THE Ludlum Steel Company has awarded contracts for construction of an addition to its wire plant in this city, according to a recent announcement by Frank B. Lounsberry, vice-president. Plans provide for a one-story unit 70 by 100 feet in size to cost $40,000 or more. New equipment and electric furnaces will be installed for the manufacture of alloy steel wire, nickel and monel metal wire. The new unit is scheduled to be ready for operation late this Fall.

HIGH SPEED
Welding Wire Straightening and Cutting Machinery
Round Wire Straightening and Cutting Machinery
Flat Wire Straightening and Cutting Machinery
Roll and Rotary Wire Straighteners
THE F. B. SHUSTER CO.
New Haven, Conn.
Straightener Specialists Since 1866

PAPER CABLE FILLER
FOLDED PAPER FLATS
PAPER INSULATION YARNS
E. W. TWITCHELL, INC.
Formerly National Patent Reed Co.
3rd & Somerset Sts. Phila., Pa.

ZINC STRIP AND WIRE
THE PLATT BROS. & CO.
WATERBURY, CONN.

RUESCH
Machinery For
Wire, Tube, And Brass Mills
409 Mulberry St., Newark, N. J.

Broden Construction Co.
Wire Mill and Cold Rolling Equipment
10255 Harvard Ave.
CLEVELAND, OHIO

WIRE DRAWING MACHINERY AND EQUIPMENT
Rod Frames—16" Frames, 8" Frames —Take-Up Frames, Wire Pointers—Puller Tongs.
General Castings for Wire Mill use.
Circulars on Request.
E. J. SCUDDER FOUNDRY & MACHINE CO.
TRENTON, N. J.

Wire Mill Equipment, Stranding, Insulating, Drawing, Welding
Thomson-Judd Wire Machinery Co.
Subsidiary of
Thomson-Gibb Electric Welding Co.
Lynn, Massachusetts.

Continuous Straightening and Cutting Machinery
With
FLYING SHEAR
for round and shaped wire.
✦ ✦ ✦
THE HALLDEN MACHINE COMPANY
THOMASTON CONNECTICUT

BUYERS' GUIDE

For more complete information, consult the annual Directory, Index & Buyers' Guide.

ABRASIVES—
Norton Co., Worcester, Mass.

ANNEALING POTS AND BOXES
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.

ARMORING EQUIPMENT
Amer. Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

BAKERS
Morgan Construction Co., Worcester, Mass.
Morrison Engineering Co., Cleveland, O.
Vaughn Machinery Co., Cuyahoga Falls, O.

BORON CARBIDE—
Norton Co., Worcester, Mass.

CEMENTS—Refractory
Norton Co., Worcester, Mass.

CHEMICALS—Cleaning
American Chemical Paint Co., Ambler, Pa.
Delany Chemical Co., Tacony Station, Philadelphia, Pa.

CLEANING & PICKLING EQUIPMENT
Broden Construction Co., Cleveland, O.
Duriron Co., The, Dayton, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

COATING—Protective
American Lanolin Corp., Lawrence, Mass.

COILERS—Sheet, Strip and Wire
Borden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
H. J. Ruesch Machine Co., Newark, N. J.

COLD HEADERS—
Ajax Manufacturing Co., Cleveland, O.

CONDUITS—Iron and Steel
Youngstown Sheet & Tube Co., Youngstown, Ohio.

CRANES—Wire Mill
Cleveland Electric Tramrail Div., of Cleveland Crane & Eng. Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

DIES—Diamond
Balloffet Diamond Wire Dies Co., Inc., N. Y. C.
Cochaud Wire Die Co., New York.
Driver-Harris Co., Harrison, N. J.
Kelly Wire Die Corp., New York, N. Y.
Union Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York.

DIES—Lead Extrusion
John Robertson Co., Brooklyn, N. Y.

DIES—Repairs & Re-Cutting
Cochaud Wire Die Corp., New York.
Driver-Harris Co., Harrison, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Union Wire Die Corp., New York, N. Y.
Vianney Wire Die Wks., N. Y.

DIES—Rod and Tube Drawing
Bissett Steel Co., Div. of Tungsten Electric Co., Cleveland, O.
Carboloy Co., Inc., Newark, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Master Wire Die Corp., New York, N. Y.
Union Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York, N. Y.

DIES—Tantalum Carbide
Bissett Steel Co., Div. of Tungsten Electric Co., Cleveland, O.
Kelly Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York, N. Y.

DIES—Tungsten Carbide
Bissett Steel Co., Div. of Tungsten Electric Corp., Cleveland, O.
Carboloy Co., Inc., Newark, N. J.
Driver-Harris Co., Harrison, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Master Wire Die Corp., New York, N. Y.
Union Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York, N. Y.

DRAW BENCHES
H. J. Ruesch Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.

ENGINEER—Consulting Wire Mill
Lewis, Kenneth B., New York, N. Y.

ENGINEERS—CONSULTING—Non-ferrous Wire Mill
New Products Development Corp., Yonkers, N. Y.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FILLERS—Paper for Cable
E. W. Twitchell, Inc., Phila., Pa.

FURNACES—Annealing
Electric Furnace Co., Salem, O.
Surface Combustion Co., Toledo, O.

FURNACES—Automatic
Electric Furnace Co., Salem, O.
Surface Combustion Co., Toledo, O.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, O.
General Electric Co., Schnectady, N. Y.
Surface Combustion Co., Toledo, O.

FURNACES—Electric
Electric Furnace Co., Salem, O.
Surface Combustion Co., Toledo, O.

FURNACES—Lead Melting
Electric Furnace Co., Salem, O.
John Robertson Co., Brooklyn, N. Y.
Surface Combustion Co., Toledo, O.

FURNACES—Non-Oxidizing
Electric Furnace Co., Salem, O.
Surface Combustion Co., Toledo, O.

FURNACES—Wire, Strip and Sheet
Electric Furnace Co., Salem, O.
Surface Combustion Co., Toledo, O.

GEARS—Wire Mill
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Lewis Foundry & Machine Co., Pittsburgh, Pa.

GRINDERS—Roll
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Norton Co., Worcester, Mass.

HANDLING EQUIPMENT—Material
Cleveland Electric Tramrail, Div. of Cleveland Crane & Eng. Co., Wickliffe, O.

INHIBITORS
American Chemical Paint Co., Ambler, Pa.
Delany Chemical Co., Tacony Station, Philadelphia, Pa.
Parkin Co., The Wm., Pittsburgh, Pa.

INSULATION—Cable or Cable Filler
E. W. Twitchell, Inc., Phila., Pa.

LATHES—Die Reaming
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

LIME—Pulverized
Amer. Lime & Stone Co., Bellefonte, Pa.

LUBRICANTS—Wire Drawing
R. H. Miller Co., Homer, N. Y.
J. T. Robertson & Co., Syracuse, N. Y.

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
John Robertson Co., Brooklyn, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Brazing
Thomson-Judd Wire Machinery Co., Lynn, Mass.

MACHINERY—Bunching
Amer. Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Electric
American Insulating Machinery Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Company, Paterson, N. J.

MACHINERY—Chain Making
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Coilers
Broden Const. Co., Cleveland, O.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Morgan Const. Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cold Heading With Wire Drawing Attachment
Ajax Manufacturing Co., Cleveland, O.

MACHINERY—Copper Wire Drawing and Rolling
Farrel-Birmingham Co., Inc., Ansonia, Conn.
H. J. Ruesch Machine Co., Newark, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Cutting
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Hallden Machine Co., Thomaston, Conn.
Lewis Machine Co., Cleveland, O.
F. B. Shuster Co., New Haven, Conn.
W. A. Schuyler, New York, N. Y.
Sleeper & Hartley, Worcester, Mass.

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.

MACHINERY—Extruding
John Robertson Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Flat Wire
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Forming
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Galvanizing Wire
Broden Construction Co., Cleveland, O.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Gang Winders
H. J. Ruesch Machine Co., Newark, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., Worcester, Mass.

MACHINERY—Insulating
American Insulating Machinery Co., Phila.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lead Encasing Presses, etc.
John Robertson Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
John Robertson Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Material Handling
Cleveland Electric Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio.

MACHINERY—Measuring Wire & Cable
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Panning
American Insulating Machinery Co., Phila.

MACHINERY—Pointing
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
E. J. Scudder Foundry & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

BUYERS' GUIDE, Continued

MACHINERY—Rod Mill
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Lewis F'dry & Machine Co., Pittsburgh, Pa.
Morgan Const. Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
W. A. Schuyler, New York, N. Y.

MACHINERY—Rolling Mill
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Lewis F'dry & Machine Co., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark. N. J.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Rubber Strip Covering
Farrel-Birmingham Co., Inc., Ansonia, Conn.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Rubber Tubing and Straining
Farrel-Birmingham Co., Inc., Ansonia, Conn.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Screw Wire
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila. Pa.
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
E. J. Scudder Foundry and Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Special—Combination Machine for Drawing, Cutting-to-length, Straightening and Reeling Bars from Coil in One Operation (Shumag Type)—
W. A. Schuyler, New York, N. Y.

MACHINERY—Spooling
American Insulating Machinery Co., Phila.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Watson Machine Co., Paterson. N. J.

MACHINERY—Spring Making
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Broden Construction Co., Cleveland, O.
Hallden Machine Co., Thomaston, Conn.
Lewis Machine Co., The, Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
W. A. Schuyler, New York, N. Y.
F. B. Shuster, New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Stranding
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Broden Const. Co., Cleveland, O.
Lewis F'dry & Machine Co., Pittsburgh, Pa.
H. J. Ruesch Machine Co., Newark, N. J.

MACHINERY—Swaging
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Worcester, Mass.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Taping
Amer. Insulating Mach. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Tinsel Rolling Mills
Amer. Insulating Mach'y Co., Phila., Pa.

MACHINERY—Trolley Wire
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
H. J. Ruesch Machine Co., Newark, N. J.

MACHINERY—Welding Wire
Micro Products Co., Chicago, Ill.
F. B. Shuster Co., New Haven, Conn.
Thomson-Judd Wire Machinery Co., Lynn, Mass.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Drawing
American Insulating Machinery Co., Phila.
Broden Const. Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
E. J. Scudder Foundry & Machine Co., Trenton, N. J.
W. A. Schuyler, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Company, Paterson, N. J.

MACHINERY—Wire Tinning
American Insulating Mach'y Co., Phila., Pa.

MACHINERY—Wrapping Wire
W. A. Schuyler, New York, N. Y.

MATERIAL HANDLING EQUIPMENT—
Cleveland Electric Tramrail Div., of Cleveland Crane & Eng. Co., Cleveland, O.

PAPER—Insulating
E. W. Twitchell, Inc., Phila., Pa.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Delany Chemical Co., Tacony Station, Philadelphia, Pa.
Parkin Co., The Wm., Pittsburgh, Pa.

POTS—Lead Melting
John Robertson Co., Brooklyn, N. Y.

PRESSES—Hydraulic and Mechanical
Farrel-Birmingham Co., Inc., Ansonia, Conn.
John Robertson Co., Brooklyn, N. Y.

PRESSES—Lead Encasing
Farrel-Birmingham Co., Ansonia, Conn.
John Robertson Co., Brooklyn, N. Y.

PRESSES—Lead Extrusion
Farrel-Birmingham Co., Ansonia, Conn.
John Robertson Co., Brooklyn, N. Y.

PULLERS—Wire
E. J. Scudder Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
John Robertson Co., Brooklyn, N. Y.

REEL AND TENSION STAND—
Sleeper & Hartley, Inc., Worcester, Mass.

REEL CRUTCHES
Watson Machine Co., Paterson, N. J.

REFRACTORIES—High Temperature
Norton Co., Worcester, Mass.

ROD BAKERS—
Morrison Engineering Co., Cleveland, O.

RODS—Wire—Non Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.

RODS—Wire—Steel
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Republic Steel Co., Youngstown, O.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

ROLLING MILLS—See Machinery—Rolling Mill

ROLLS—
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Lewis F'dry & Machine Co., Pittsburgh, Pa.

RUST PROOF COMPOUND
American Lanolin Co., Lawrence, Mass.

SHEET—Steel
Continental Steel Corp., Kokomo, Ind.
Republic Steel Co., Youngstown, O.
Superior Sheet Steel Co., Canton, O.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SOAPS—Wire Drawing
R. H. Miller Co., Homer, N. Y.
J. T. Robertson & Co., Syracuse, N. Y.

STRIP—Brass, Zinc and Non Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.

STRIP—Steel
Continental Steel Corp., Kokomo, Ind.
Driver-Harris Co., Harrison, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Republic Steel Co., Youngstown, O.
Wheeling Steel Corp., Wheeling, W. Va.

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TREADS—Safety
Norton Co., Worcester, Mass.

TRUCKS
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

TUBE BENDERS AND FORMERS
H. J. Ruesch Machine Co., Newark, N. J.

VALVES AND FITTINGS—Acid Proof
Duriron Co., The, Dayton, O.

VULCANIZERS
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS
American Insulating Mach'y Co., Phila., Pa.

WIRE—Cold Heading
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Republic Steel Corp., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Electric
Hudson Wire Co., Ossining, N. Y.

WIRE—Enameled For Coils
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Continental Steel Co., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Republic Steel Co., Youngstown, O.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, Ohio

WIRE—Nickel Silver and Phosphor Bronze
Hudson Wire Company, Ossining, N. Y.

WIRE—Non Ferrous to Specification For Special Purposes
Hudson Wire Co., Ossining, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
Continental Steel Corp., Kokomo, Ind.
Keystone Steel and Wire Co., Peoria, Ill.
Republic Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Continental Steel Corp., Kokomo, Ind.
Keystone Steel and Wire Co., Peoria, Ill.
Republic Steel Co., Youngstown, O.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE AND STRIP—Brass, Zinc
Platt Bros. & Co., The, Waterbury, Conn.

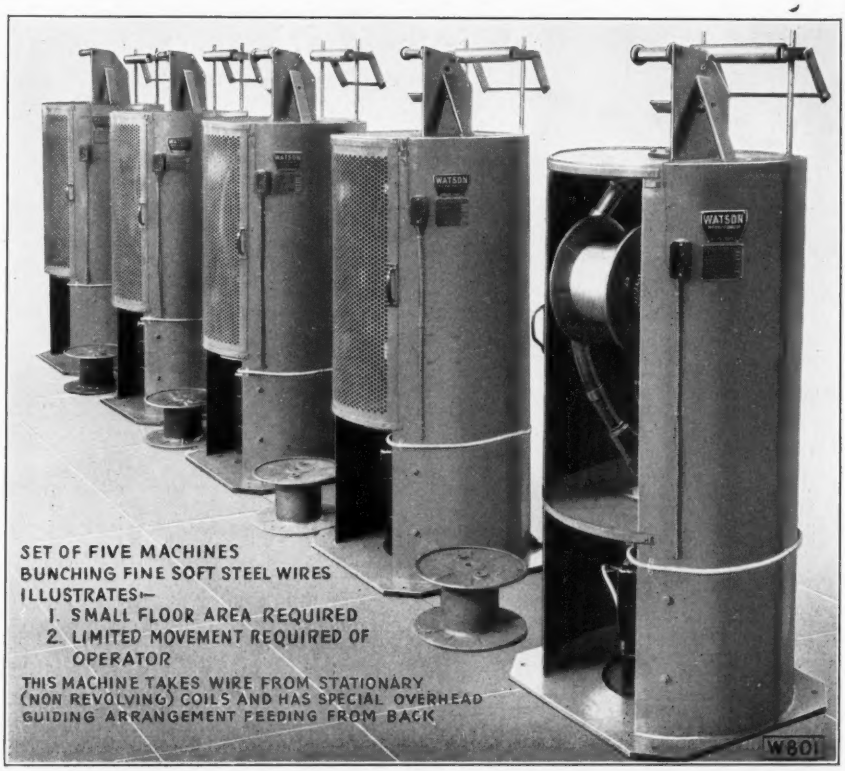
This is a carefully classified index of concerns who specialize in this industry and who advertise regularly in WIRE & WIRE PRODUCTS. Please mention WIRE when writing to these firms.

THE WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON, NEW JERSEY, U. S. A.

ENGINEERS - FOUNDERS - MACHINISTS


WATSON
WATSON
SET OF FIVE MACHINES
BUNCHING FINE SOFT STEEL WIRES
ILLUSTRATES—
1. SMALL FLOOR AREA REQUIRED
2. LIMITED MOVEMENT REQUIRED OF OPERATOR
THIS MACHINE TAKES WIRE FROM STATIONARY (NON REVOLVING) COILS AND HAS SPECIAL OVERHEAD GUIDING ARRANGEMENT FEEDING FROM BACK
W801

A modern high capacity installation of five WATSON BUNCHERS V7 for fine wire bunching, for single operator is shown above.

At 1″ lay 42,000 feet of strand is produced hourly.

Small floor area, and automatic electric stops enable single operator to take care of eight machines with ease.

Send for latest bulletin and prices.

Continuous

CONTROLLED ATMOSPHERE FURNACES

Designed to Fit
Your Specific Requirements

Bright Annealing

The several installations shown on this page represent a few of the various types of controlled atmosphere furnaces we have built for scale-free heat treating, brazing, and bright annealing miscellaneous ferrous and non-ferrous products in various shapes and forms.

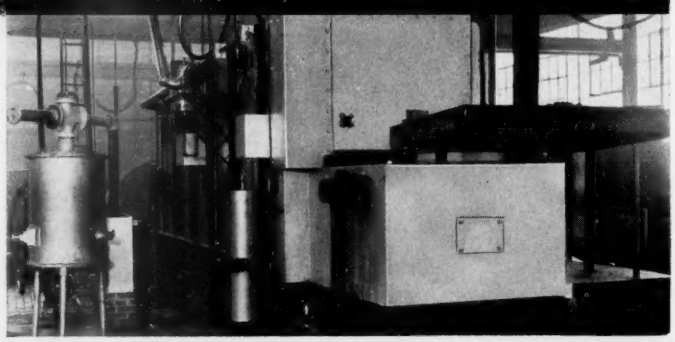
(Left) A recent installation for bright annealing cold drawn seamless steel tubing. Other outstanding installations made for bright annealing ferrous and non-ferrous stampings, wire, sheet, strip and tubing in coils and straight lengths.

Brazing and Soldering

(Right) Two pusher type furnaces brazing miscellaneous automotive and refrigerator parts. The assemblies are automatically conveyed through the furnace and discharged completely brazed — clean and bright. Other types and sizes for various other products.

(Below) One of our standard continuous chain belt conveyor type furnaces designed for use with our inexpensive Elfurno gas atmosphere for clean and bright hardening bolts, screws and other small and medium size products.

Scale-free Heat Treating



The application of controlled atmosphere equipment to the annealing, heat treating and brazing of metals has advanced rapidly since the development of our inexpensive Elfurno gas atmosphere. It should be given serious consideration in the planning of all new furnace equipment or the modernization of present equipment.

Our engineers will be glad to discuss with you our developments in controlled atmosphere equipment for scale-free hardening and clean and bright annealing wire & wire products.

THE ELECTRIC FURNACE CO.

SALEM, OHIO.

Fuel Fired Furnaces

Electric Furnaces